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THE DEMAND FOR YOUTH LABOR: A CROSS-SECTIONAL APPROACH

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THE DEMAND FOR YOUTH LABOR:
A CROSS-SECTIONAL APPROACH

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ABSTRACT

Despite the recent resurgence of research interest in the labor market experience of youth, evidence on the demand for youth is very sparse. The majority of the research has given disproportionate attention to the relationship between minimum wages and youth unemployment. The studies that have specifically examined youth unemployment can provide no consensus on the direction or strength of the unemployment response to minimum wage changes. However, if the relationship between the youth wage rate and the supply of youth labor is insignificant, as some studies suggest, or if the "income effect" swamps the "substitution effect," as other studies suggest, variations in the minimum wage might affect youth unemployment through its impact on the demand for youth labor.

The theoretical underpinnings of a demand for youth labor function are developed here. Starting with cost minimization for a single competitive firm faced with a linearly homogeneous production function of the Cobb-Douglas variety, proportionate demand functions for sectors covered and uncovered by the minimum wage are developed. These are aggregated to form a two sector meta proportionate demand function. It is shown that the proportion of total demand directed toward youth is a function of relative wages, relative output elasticities and the proportion of youth demanded in the covered and uncovered sectors.

Factors other than those embodied in the meta proportionate demand function for youth are shown to have possible effects on the proportion of total demand directed toward youth. The peripherality of the job structure, the educational structure of employment and the relative differences in skill levels between labor classes may have possible impacts on the proportionate demand for youth. Also, given that nonwage costs of employment are not minimal, cyclical variations in demand will have an impact on the proportionate demand for youth.

Four separate meta proportionate demand functions for youth are estimated using data compiled from the one in one hundred public use sample tapes from the 1970 census. Each of the functions is estimated for various sex, color and age

groups. The estimated coefficients of the demand function suggest that, in terms of quality changes, whites are substitutes for those workers with higher levels of education (upper class workers) and complements to those workers with lower levels of education (lower class workers). Conversely, nonwhites are substitutes for the lower class workers and complements to the upper class workers.

The peripherality of the job structure is found to have a positive impact on the proportion of total demand directed toward youth. The proportionate demand for the younger cohort group is found to be affected to a greater extent by the number and type of peripheral jobs than the proportionate demand for the older cohort group. Conversely, the educational structure of employment is found to have a negative impact on the proportion of total demand directed toward youth. The proportionate demand for the older cohort group is found to be affected to a greater degree by the level of education attached to the job structure than the proportionate demand for the younger cohort group.

The rate of growth is found to have a positive impact on the proportion of total demand directed toward youth. The proportionate demand for the younger cohort group appears to be affected to a greater degree by variations in the rate of growth than the proportionate demand for the older cohort

group. However, the extent of minimum wage coverage is found to adversely affect only the proportionate demand for the younger male cohort group.

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Chapter 1

INTRODUCTION

Psychologists and sociologists have found youth a fertile research field. However, until the last decade, economists have largely ignored the youngest group of labor market participants. Traditionally, an economic analysis of the labor force experience of youth has been delegated a supplementary role in broad studies of the supply and demand for labor by demographic groups. It was not until the early nineteen-sixties that many labor economists began to focus primary attention on the labor market experience of youth. Even then, this attention was narrowed to the problem of youth unemployment.

Since 1948, youth unemployment rates have consistently been greater than the unemployment rates for older labor force participants. The chronically high youth unemployment rates were evidently not sufficient to generate a large amount of research interest in the labor market experience of youth. However, starting in the very early sixties, the unemployment rates for youth began to increase relative to the unemployment rates for older cohort groups. From 1961 to 1969, the ratio of the unemployment rate for 16-19 year olds to the unemployment rate for workers 25 years old and older increased at an annual average rate of 7.7 percent. However, since

1970 the ratio has shown some decline. It was the relative increase in youth unemployment, and not its high level, which appears to have stimulated research interest in the labor market experience of youth among labor economists.

Past studies of the labor market experience of youth have centered on the demand for youth labor, the labor force participation of youth and youth unemployment in general. Of these three areas, youth unemployment has received the greatest attention. Almost all studies of youth unemployment have concentrated attention on the relationship between federal minimum wages and youth unemployment. Unfortunately, these studies have provided more new questions than answers to old questions.

Very few studies have specifically examined the labor force participation of youth or the demand for youth labor. A great deal is known about how individual characteristics affect the labor force participation of youth, but virtually nothing is known about the relationship between area characteristics, aside from the rate of unemployment, and the labor force participation of youth. Even less is known about the determinants of the demand for youth labor. The few studies that have examined the question are capable of providing only partial and, in some cases, inconsistent answers.

It appears that much more research needs to be done in all three areas before a historical analysis of the labor market experience of youth can be conducted. Our knowledge of the determinants of the demand for youth labor is especially deficient. At this point in time there are no reliable estimates of the output elasticities for youth, nor the elasticities of substitution between youth and other workers. Likewise, little is known about how variations in the nature of the production process affects the demand for youth labor. The question of how the minimum wage affects the demand for youth labor also remains largely unanswered. It is these areas that this study plans to investigate.

1.1 An Introduction to the Demand for Youth Labor

Characteristics specific to youth tend to place them at some disadvantage in competing for jobs with adults. Inadequate experience, limited education and age prevent youth from entering jobs which involve the acceptance of responsibility, the exercise of authority or the need for prior training. Inadequate experience and perhaps the lack of maturity tend to reduce the productivity of youth relative to the productivity of adults. Higher mobility rates and shorter periods of job tenure tend to increase the nonwage costs of youth employment relative to the nonwage costs of adult employment.

These distinctions between youth and adults are not precise, only useful. Both youth and adults form highly heterogeneous groups. Some youth can be expected to have greater maturity and more experience and education than the average adult. Likewise, some adults can be expected to have less maturity, experience and education than the average youth. Hence, the productivity of some youth will be greater than the productivity of some adults. However, as a group, the productivity of youth will be below the productivity of adults.

Although, relative to adults, youth are lower quality and higher nonwage costs employees, they are still potential substitutes for adults in a wide variety of jobs. However, youth labor will be substituted for adult labor only as long as youth are willing to accept a wage below the adult wage. At some relative wage, employers will be indifferent between youth and adults.

Quality differences between youth and adults may not be of degree, but rather of kind. They may be so large or of such a nature that the possibilities for substitution are very limited. While this is not true for all jobs, it is certainly true for jobs which require a lengthy period of training, the acceptance of a large degree of responsibility or the exercise of authority. Hence, the occupational or industrial structure can be expected to dampen the impact relative wages and aggregate demand have on the demand for youth labor.

For many activities in the U.S. economy, the assumption of flexible wages is clearly untenable. There exists many market impediments which may prevent youth wages from falling sufficiently to fully offset the lower productivity or higher nonwage costs of youth. Such impediments include relatively high negotiated wages at the entrance job level in unionized firms, the federal minimum wage, state minimum wages and the existence of a "social minimum wage."

The existence of a floor to the youth wage means that youth may be willing to accept a lower wage than the current market wage. The relative wage at which employers would be indifferent between youth and adults is higher than the current relative wage, but unobtainable because of the impediments to full wage flexibility.

If the current relative wage is less than the relative wage that would make employers indifferent between the utilization of adult labor and youth labor, it does not mean that no youth will be hired. Those youth whose high productivity and lengthy periods of tenure offset the high youth wage will still be hired. Thus, in those activities which are constrained by high youth wage floors, only the higher quality youth workers will be hired.

The federal minimum wage has been singled out in past studies as the greatest impediment to full wage flexibility. However, coverage under the federal minimum wage is not universal. A wide variety of jobs remain uncovered by minimum wage legislation. Given an increase in the minimum wage with a corresponding decline in the demand for youth, disemployed youth still may be able to obtain employment in the uncovered sector.

To summarize, the principal determinants of the demand for youth labor appear to be relative wages, the level of aggregate demand or its rate of growth, the occupational or industrial structure and the extensiveness of minimum wage coverage. Admittedly, these conclusions are based on a very simple approach to the analysis. However, it will be shown that the same conclusions can be derived from a more sophisticated analysis which pays extensive tribute to basic economic theory.

1.2 Plan of Report

The plan of this report calls for a review of the methods and evidence from past investigations of the labor market experience of youth, a discussion of the theoretical underpinnings of a demand for youth labor function, a specification of the theoretical models to be utilized in the empirical investigation, and a discussion of the empirical findings.

The second chapter of this study considers the recent evidence that has emerged concerning the labor market experience of youth. Evidence on the labor force participation of youth, the demand for youth labor and youth unemployment is reviewed. Since it is a reflection of the state of the art, disproportionate attention is given to the relationship between minimum wages and youth unemployment.

The theoretical underpinnings of a demand for youth labor function are presented in Chapter Three. The function differs from the more traditional demand functions in that it is concerned not with the volume of youth labor demanded, but with the proportion of total labor demand directed toward youth.

The results from the empirical investigation are reported in Chapter Four. Several different forms of the demand for youth labor function were tested. In total, they provide valuable evidence on the demand for youth labor. The summary and conclusions of this study are provided in Chapter Five.

Chapter 2

THE DEMAND FOR YOUTH LABOR, THE LABOR FORCE PARTICIPATION OF YOUTH AND YOUTH UNEMPLOYMENT: A REVIEW OF RECENT EVIDENCE

Since the mid-1960's, a great deal of attention has been devoted to the subject of youth unemployment. More than a dozen studies, including a highly ambitious one by the U.S. Department of Labor, have been undertaken in this area since 1968. The majority of these studies have examined youth unemployment in general, and have not attempted to identify the underlying supply and demand relationships. All of these studies have focused primary attention on federal minimum wage laws as a cause of youth unemployment. They have attempted to establish a quantitative relationship between youth unemployment, some measure of general business conditions or general labor market conditions, and the minimum wage.

The majority of the studies which have dealt with youth unemployment have shown a surprising lack of concern with the basic model underlying their analysis. The first section of the present chapter attempts to provide a theoretical framework for a discussion of the studies. No attempt will be made at analytical sophistication, and the theory underlying the studies will be presented as concisely as possible. This will be followed by a discussion of the studies which have considered the demand for youth labor, the labor force participation of youth, and youth unemployment.

2.1 A Theoretical Framework

The vast majority of the studies which have attempted to examine the nature of youth unemployment have not simultaneously examined the supply and demand functions for youth labor. Instead, they have examined an unemployment function which is derived from the supply and demand functions. Unfortunately, most such studies fail to reveal the supply and demand functions which underlie the unemployment function. This makes it very difficult to interpret the estimated parameters of the unemployment function.

The supply and demand functions can be referred to as "structural" equations and the unemployment function which is derived from them as a "reduced form" equation. The structural equations presented here do not promise to be "correct". They simply represent a structural system which leads to a reduced form equation which can be represented as a general case of the specific models presented in the various studies.

The demand for youth labor equation can be written in the form,

$$D = a\, V^{\alpha_1}\, W^{\alpha_2}\, I_n^{\alpha_n} \qquad (2\text{-}1)$$

where,

D is the quantity of youth labor demanded

V is some measure of general labor market conditions or general business conditions

W is some measure of the relevant wage

I is some set of other relevant variables

The demand equation can be shown to be a reduced form of some system of equations. When going from a structural system to a reduced form, there is a lower limit of one reduced form equation. When going from a reduced form equation to a structural system, there is no upper limit. The number of structural equations and the forms they may take are infinite. Where one stops expanding the system and the form the system is specified in is purely arbitrary. For present purposes, a single demand equation with n + 2 exogeneous variables is sufficient.

Given the state of the labor market, an increase in the minimum wage above the market clearing wage that would prevail in the absence of the minimum will cause a decrease in the amount of labor demanded. It appears that most economists agree on this result from the application of basic price theory.[1] Thus, assuming the minimum wage is

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[1]Stigler made this observation some years ago. The result is obtained by assuming a competitive system. It appears that the possibility of other outcomes are purely theoretical artifacts. See George Stigler, "The Economics of Minimum Wage Legislation," American Economic Review 36 (June 1946): 358-365.

the relevant wage, an effective increase in the minimum wage will stimulate a reduction in the demand for youth labor.

The supply of youth labor equation can be written in the form,

$$S = b\, V^{\beta_1} W^{\beta_2} I_n^{\beta_n} \qquad (2\text{-}2)$$

where,

S is the quantity of youth labor supplied

Given the state of the labor market, an increase in the minimum wage above the market clearing wage that would prevail in the absence of the minimum will cause an increase in the amount of labor supplied. This can be expected as long as the "income effect" does not swamp the "substitution effect".[2] Thus, if the minimum wage is the relevant wage, an increase in the minimum wage will stimulate an increase in the supply of youth labor.

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[2]In the interest of brevity, the theory of labor supply will not be expounded upon here. For the traditional approach to labor force participation, see Edward Jakubauskas and Neil Palomba, Manpower Economics (Reading: Addison-Wesley Publishing Company, 1973), pp. 46-53. For a more general approach, see Gary Becker, "A Theory of the Allocation of Time," The Economic Journal 75 (September 1965): 493-517.

The youth unemployment rate can be defined as,

$$U = (S - D) / S \qquad (2\text{-}3)$$

where,

U is the rate of youth unemployment

Substituting equation (2-1) and equation (2-2) into equation (2-3), the "reduced form" equation can be written as,

$$U = 1 - (a/b)\ V^{(\alpha_1 - \beta_1)} W^{(\alpha_2 - \beta_2)} I_n^{(\alpha_n - \beta_n)} \qquad (2\text{-}4)$$

By approximating equation (2-4) in log form, the model can be estimated using ordinary least squares in the form,

$$\log U = \theta + \lambda_1 \log V + \lambda_2 \log W + \sum_{j=3}^{n+2} \lambda_j I_j + e \qquad (2\text{-}5)$$

The estimated parameters of equation (2-5) can be readily translated into the original parameters of the structural equations since,

$$\theta = \log (1 - a/b) \qquad (2\text{-}6a)$$

$$\lambda_1 = (\alpha_1 - \beta_1) \qquad (2\text{-}6b)$$

$$\lambda_2 = (\alpha_2 - \beta_2) \qquad (2\text{-}6c)$$

$$\lambda_j = (\alpha_j - \beta_j) \qquad (2\text{-}6d)$$

From equation (2-5) it should be obvious that if the minimum wage is the relevant wage, an effective increase in the minimum wage which stimulates a demand response will cause a corresponding increase in the unemployment rate only if the supply response is not strongly negative. Likewise, if the minimum wage is the relevant supply wage, an effective increase in the minimum wage which stimulates a positive supply response will cause a corresponding increase in the unemployment rate even in the absence of a demand response.

It is possible to proceed directly from the very simple, general model presented in this section to the more specific models that various authors have presented. It should be kept in mind that none of the specific models are exactly like the general model. However, all of them can be fit into the framework of the general model. The estimated parameters of any of the reduced form equations are the net outcome of a supply response and a demand response.

2.2 The Demand for Youth Labor

Seven studies have specifically examined the demand for youth labor. The earliest of these studies is one undertaken by Barth.[3] Barth specifies his demand equation in a

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[3] Peter Barth, "The Minimum Wage and Teenage Unemployment," Industrial Relations Research Association, Proceedings of the Twenty-second Annual Meeting (Madison: n.p., 1969), pp. 296-310.

form similar to equation (2-1), where the relevant wage is the minimum wage. His demand for youth labor function can be written as,

$$\log E_{it} = a + b_1 \log E_{at} + b_2 D_t + b_3 \log T_t + e_t \quad (2\text{-}7)$$

where,

E_i is the level of employment of the ith sex-color youth group

E_a is the level of employment for all persons twenty years old and older

T is a linear trend term

D is a binary variable taking the value one in periods the minimum wage was change and zero otherwise

e is an error term

Ignoring the trend term, one would have,

$$\log E_{it} = (a + b_2) + b_1 \log E_{at} + e_t \quad (2\text{-}8a)$$

during a period when the minimum wage was changed, and

$$\log E_{it} = a + b_1 \log E_{at} + e_t \quad (2\text{-}8b)$$

during a period when there was no change in the minimum wage.

The coefficients of equation (2-7) were estimated using ordinary least squares with quarterly and monthly data for the time period from January 1954 to December 1968. In all cases, the level of adult employment and the trend variable were significant at the one percent level, while the binary minimum wage variable was never significant.

The use of only one binary minimum wage variable is a questionable specification of the model. During the period of time the model was run, there were seven basic changes in the minimum wage and/or in minimum wage coverage. Some of these changes may have had great impact, while some may have had little. The use of a single binary variable mixes these different impacts into a single measure. A correct specification would include seven binary variables, one for each change in the minimum wage. Also, the binary variable assumes the value one only during the period the minimum wage was changed. This implies very strange behavior on the part of youth and employers. It is doubtful that after the passage of one period the minimum will no longer be "effective".

Barth appears to recognize the problems attached to using a single binary variable to capture the effect of repeated changes in the level of the minimum wage. He proceeds to rewrite the model in the form,

$$\log E_{it} = a + b_1 \log E_{at} + \sum_{j=2}^{8} b_j D_{jt} + b_9 \log T_t + e_t \quad (2\text{-}9)$$

Ignoring the trend term, one would have

$$\log E_{it} = (a + b_j) + b_1 E_{at} + e_t \quad (2\text{-}10a)$$

during the period with the j - 1 change in the minimum wage, and

$$\log E_{it} = a + b_1 E_{at} + e_t \tag{2-10b}$$

during a period with no change in the minimum wage.

The coefficients of equation (2-9) were estimated using ordinary least squares with monthly data. In all cases the adult employment level and the trend variable were significant at the one percent level. In only three instances out of twenty-eight were any of the binary variables significant and of the right sign. In nine instances it was significant, but of the wrong sign. Barth concludes that the level of the minimum wage has little or no effect on the demand for youth labor.

The use of binary variables in the Barth study fails to account for the possible deterioration of the minimum wage over time and the lagged response of employers to minimum wage changes. The full impact of a minimum wage change may not be felt for several months or even several years. After some point, its impact can be expected to diminish as money wages increase and/or youth productivity increases over time. The use of a binary variable fails to capture these effects. If the binary variable takes the value one only in the current period, then it fails to capture the effect of the minimum wage as employers adjust to it over time. If it retains the value one for some discreet time period following the minimum wage change, then it cannot capture the influence of rising money wages and/or rising youth productivity over time.

The Barth study implicitly assumes that the minimum wage affects only the intercept of the demand function and not its slope (see equations (2-10a) and (2-10b)). That is to say, at all levels of adult employment, the minimum wage affects youth employment by some additive constant, b_j. However, if the supply of adult labor is not perfectly elastic at the current adult wage, adult wages, nonwage hiring costs and vacancies will increase as adult employment increases. One would then expect the minimum wage to have much less of an impact on youth employment at high levels of adult employment. Ignoring the trend term, a more logical specification would seem to be,

$$E_{it} = a + b_1 E_{at} + \sum_{j=2}^{8} (b_j D_j + b_{j+7} D_j E_{at}) + e_t \qquad (2\text{-}11)$$

Then one would have,

$$E_{it} = (a + b_j) + (b_1 + b_{j+7}) E_{at} + e_t \qquad (2\text{-}12a)$$

during the period with the j - 1 change in the minimum wage and,

$$E_{it} = a + b_1 E_{at} + e_t \qquad (2\text{-}12b)$$

during a period with no change in the minimum wage.

Mincer also has investigated the relationship between the demand for youth labor and the minimum wage. Using the

Almon distributed lag method, he attempts to explain the ratio of youth employment to youth population in terms of a measure of the minimum wage and the unemployment rate of adult males. The model was estimated using quarterly data from 1954 to 1969. He finds the minimum wage measure to be insignificant for 16-19 year old nonwhites. However, he estimates a wage elasticity of -.20 for 16-19 year old whites.[4] Unfortunately, Mincer presents only summary statistics, so no serious evaluation of the model will be attempted.

Kalachek presents a youth employment model based on the flexible labor market hypothesis and the theory of the queue.[5] It can be assumed that youth have lower specific productivity and higher nonwage costs than adults. However, at some relative wage, employers will be indifferent between youth and adults. It is highly unlikely that wages are perfectly flexible in the face of state and federal minimum

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[4]Jacob Mincer, "Unemployment Effects of Minimum Wages," National Bureau of Economic Research, March 1974, p. 26, Table 2. (Mimeographed.)

[5]Edward Kalachek, The Youth Labor Market, University of Michigan-Wayne State University, Institute of Labor and Industrial Relations, Policy Papers in Human Resources and Industrial Relations, No. 12 (n.p. 1969), pp. 8-29; and Edward Kalachek, "Determinants of Teenage Employment," The Journal of Human Resources 4 (Winter 1969): 1-21.

wage laws, union bargaining and "the social minimum". Hence, given some significant level of unemployment and an elastic supply of adult and youth labor, employers will prefer to hire adult labor and youth will be disproportionately concentrated among the unemployed. As full employment is approached, employers find it increasingly costly to insist on adult labor, due to increasing vacancies, recruiting expenditures, and adult wages, and youth employment will expand. Since youth, on the average, have less experience and a lower productivity than adults, the degree of substitutability will depend on the industrial or the occupational structure. Youth employment should then be explainable on the basis of the availability of adult labor, the flexibility of wages, and the occupational or industrial structure of employment.

The equation estimated by Kalachek can be specified in the form,

$$E_i = a + b_1 P_i + b_2 U_i + b_3 W_i + b_4 S_i + \sum_{j=1}^{m} b_{ij} I_{ij} + e_i \tag{2-13}$$

where,

E is the ratio of youth employment to total employment

P is the ratio of youth population to total population

U is the total unemployment rate

W is the average weekly earnings of youth

S is a measure of the industrial or occupational structure

I is a set of other "relevant" variables

The results indicate that the occupational structure has the greatest impact for the youngest youth. The coefficient for average weekly earnings also has the expected negative sign. However, the model itself is disturbing in its composition. It appears as if each variable was included in the model to test some separate hypothesis and the model itself is not tied together by some overall theory. On this basis, it is difficult to judge the overall significance of the findings. That is not to say that the individual correlation coefficients are not of interest. It is just that it is difficult to interpret them as a whole without a more formal underlying theory.

The last three studies to be reviewed employ almost identical demand for youth labor equations. They include one study by Fisher and two by Katz.[6] In all three studies

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[6] Alan Fisher, "The Problem of Teenage Unemployment", (Ph.D. dissertation, University of California, Berkeley, 1973); Arnold Katz, "State Minimum Wages and Labor Markets for Youth," University of Pittsburgh, 1971. (Mimeographed.); Arnold Katz, "Teenage Employment Effects of State Minimum Wages," <u>Journal of Human Resources</u> 8 (Spring 1973): 250-256.

the demand equation is but one of a number of equations in a system of structural equations.

In his first study, Katz writes his model as seven simultaneous equations. It includes a demand equation for youth labor, a labor force participation equation for youth, an average youth wage equation, a youth market wage equation and three equations that serve to tie the system together. The demand equation can be written in the form,

$$\log E_i = a + b_1 \log \bar{W}_i + b_2 \log W_{ai} + b_3 \log Q_i + b_4 \log I_i + e_i \qquad (2\text{-}14)$$

where,

E is the level of youth employment

$\bar{W}$ is the average hourly wage rate of youth. It is considered endogeneous to the system and is determined by the state minimum wage and the youth market wage, which is also endogeneous

W_a is the wage rate of adult workers

Q is aggregate income

I is the percentage of total civilian employment in manufacturing

e is an error term

Katz estimated the coefficients of his model using 1960 census data for 66 of the largest Standard Metropolitan Statistical Areas. The estimated elasticities, as presented in the first three lines of Table 2-1, initially appear to

Table 2-1

Estimated Regression Coefficients: Katz's Demand Equation 1971 and 1973

Group	a	b_1	b_2	b_3	b_4	R^2
All Males[a] 14-19	- .416	-1.22 (2.0)	.371 (0.9)	.894 (28.3)	- .045 (0.9)	.96
Nonwhite[a] Males 14-19	- .468	-9.61 (10.0)	3.45 (3.7)	.857 (14.6)	- .079 (0.6)	.83
Nonwhite[a] Females 14-19	-1.29	-12.9 (8.5)	9.53 (6.6)	.829 (12.2)	- .557 (4.0)	.78
All Males[b] 14-19	....	- .622 (.319)	....	.918 (.025)	- .056 (.025)	.96
All Females[b] 14-19	....	- .607 (.312)	....	.991 (.025)	.022 (.051)	.96
Nonwhite[b] Males 14-19	....	-5.346 (.610)	....	.905 (.073)	-.461 (.148)	.76
Nonwhite[b] Female 14-19	....	-4.460 (.968)	....	.886 (.090)	-.410 (.187)	.64

[a]1971. The figures given in parentheses are t ratios.

[b]1973. The figures given in parentheses are standard errors.

SOURCE: Arnold Katz "State Minimum Wages and Labor Markets for Youth," University of Pittsburgh, 1971, p. 12, Table 3, (Mimeographed); and Arnold Katz, "Teenage Employment Effects of State Minimum Wages", Journal of Human Resources 8 (Spring 1973): 254, Table 2.

be quite reasonable. In all cases, the demand for youth labor is positively related to the adult wage and negatively related to the average youth wage. The demand for female youth labor is more responsive to wage changes than the demand for male youth labor, and the demand for nonwhite youth labor is more responsive to wage changes than the demand for white youth labor. In all three cases considered, a one percent increase in income is accompanied by about a .8 percent increase in the demand for youth labor.

The demand for youth labor equation can be shown to have been derived from a linearly homogeneous production function of the form,

$$Q = a\, N_y^{\alpha_1} N_a^{\alpha_2} K^k \qquad (2\text{-}15)$$

where,

N_y is youth employment

N_a is adult employment

K is capital

Q is output

Under these conditions, it can be shown that,[7]

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[7]The solution is straightforward. Given the production function of equation (2-15) and the total cost equation of the form,

$$C = \bar{W} N_y + W_a N_a + r K$$

form the Lagrangian,

$$V = \bar{W}\, N_y + W_a\, N_a + r\, K - \lambda(Q - \partial N_y \alpha_1 N_a{}^{\alpha 2} K^k)$$

The first order conditions for cost minimization are,

$$\partial V \,/\, \partial N_y = 0 = \bar{W} - \lambda(\partial \alpha_1 N_y{}^{\alpha 1 - 1} N_a{}^{\alpha 2} K^k)$$

$$\partial V \,/\, \partial N_a = 0 = W_a - \lambda(\partial \alpha_2 N_y{}^{\alpha 1} N_a{}^{\alpha 2 - 1} K^k)$$

$$\partial V \,/\, \partial K = 0 = r - \lambda(\partial k\ N_y \alpha_1 N_a{}^{\alpha 2} K^{k-1})$$

$$\partial V \,/\, \partial \lambda = 0 = Q - \partial N_y \alpha_1 N_a{}^{\alpha 2} K^k$$

Solving for the demand for youth labor,

$$\frac{\bar{W}}{W_a} = \frac{\lambda(\partial \alpha_1 N_y{}^{\alpha 1 - 1} N_a{}^{\alpha 2} K^k)}{\lambda(\partial \alpha_2 N_y{}^{\alpha 1} N_a{}^{\alpha 2 - 1} K^k)}$$

and,

$$N_a = (\bar{W} \alpha_2 N_y)\ (W_a \alpha_1)^{-1}$$

$$\frac{\bar{W}}{r} = \frac{\lambda(\partial \alpha_1 N_y{}^{\alpha 1 - 1} N_a{}^{\alpha 2} K^k)}{\lambda(\partial k\ N_y{}^{\alpha 1} N_a{}^{\alpha 2} K^{k-1})}$$

and,

$$K = (\bar{W}\ k\ N_y)\ (r\ \alpha_1)^{-1}$$

Substituting from above into the production function,

$$b_3 = (\alpha_1 + \alpha_2 + k)^{-1} \tag{2-16a}$$

$$b_1 = (\alpha_2 + k)\ (\alpha_1 + \alpha_2 + k)^{-1} \tag{2-16b}$$

$$b_2 = \alpha_2(\alpha_1 + \alpha_2 + k)^{-1} \tag{2-16c}$$

Using the estimated coefficients of the demand equation given in Table 2-1, the parameters of the production function can be solved for. These are given in the first three lines of Table 2-2. As can be observed from the table, negative output elasticities or negative factor shares are implied in all three cases. This can be interpreted as either a negative marginal product or a negative average product for youth labor. The results are disturbing enough to severely question the validity of the model.

In his later study, Katz specifies his youth labor demand equation in the form of equation (2-14), but with the adult wage excluded. Since this wage rate appears in the endogeneous average wage function and not in the demand

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$$Q = \partial(\alpha_2/\alpha_1)^{\alpha 2}\ (k/\alpha_1)^k\ (\bar{W}/W_a)^{\alpha 2}\ (\bar{W}/r)^k\ N_y^{(\alpha_1+\alpha_2+k)}$$

Assuming the price of capital is constant between SMSA, let,

$$\pi = a(\alpha_2/\alpha_1)^{\alpha 2}\ (k/\alpha_1)^k\ r^{-k}$$

Then solving for N_y,

$$N_y = \pi Q^{1/(\alpha_1+\alpha_2+k)}\ \bar{W}^{-(\alpha_1+k)/(\alpha_1+\alpha_2+k)}\ W_a^{\alpha_2/(\alpha_1+\alpha_2+k)}\ .$$

Table 2-2

Estimated Output Elasticities

Author	Group	α_1	α_2	k	$\alpha_1 + \alpha_2 + k$
Katz[a]	All Males 14-19	- .246	.414	.949	1.118
Katz[a]	Nonwhite Males 14-19	-10.05	4.049	7.187	1.166
Katz[a]	Nonwhite Females 14-19	-14.35	11.49	4.065	1.206
Katz[b]	All Males 14-19	.411	....	.677	1.089
Katz[b]	All Females 14-19	.396	....	.612	1.009
Katz[b]	Nonwhite Males 14-19	- 4.802	....	5.907	1.104
Katz[b]	Nonwhite Females 14-19	- 3.905	....	5.033	1.128
Fisher[c]	White Males 14-19	- 1.078	.292	1.910	1.123
Fisher[c]	White Females 14-19	- .857	.005	1.950	1.098
Fisher[c]	Nonwhite Males 14-19	- 1.558	-1.000	3.539	.980
Fisher[c]	Nonwhite Females 14-19	- .276	-1.057	2.285	.952

[a]Estimated from Arnold Katz, "State Minimum Wages and Labor Markets for Youth," University of Pittsburgh, 1971, p. 12, Table 3. (Mimeographed.)

[b]Estimated from Arnold Katz, "Teenage Employment Effects of State Minimum Wages," Journal of Human Resources 8 (Spring 1973): 254, Table 2.

[c]Estimated from Alan Fisher, "The Problem of Teenage Unemployment," (Ph.D. dissertation, University of California, Berkeley, 1973), p. 120, Table 3-8.

function, I am not sure what type of assumptions he is making about the labor market and his production function. Using the same data base as in his earlier study, he estimates the coefficients of equation (2-14) with the adult wage excluded. As can be observed from the last four lines of Table 2-1, the results are intuitively plausible. Assuming that the production function is of the same form as equation (2-15), except with only youth labor and capital as inputs, the parameters of the production function can be solved for. Referring to Table 2-2, the estimated output elasticities are given in the middle four lines of the table. While they are positive for the two color inclusive groups, they are also surprisingly large. The output elasticities for the two nonwhite groups are again found to be negative.

Fisher rewrites Katz's system of simultaneous equations in a slightly different manner. To control for "aggregation bias", he adds the following variables to equation (2-14),

$$+ b_5 \log Q_{ui} + b_6 \log R_i + b_7 \log S_i$$

where,

Q_u is the median years of school completed by adult males

R is the percent of the population 14 years and older, S is a binary variable taking the value 1 if the SMSA is in the South

The estimated coefficients of the Fisher model are presented in Table 2-3 and appear to be somewhat less satisfactory than the elasticities of either of Katz's models.[8] Fisher finds higher wage elasticities for white youth and lower wage elasticities for nonwhite youth than does Katz. The elasticities with respect to the adult wage also tend to be somewhat lower, even negative in two cases, than Katz's estimates.

Assuming that the production function is of the same form as equation (2-15), the parameters of the production function can again be solved for. As can be observed in the last four lines of Table 2-2, the output elasticities are negative for all four youth groups. This implies either a negative marginal product or a negative average product for youth. In this respect, the results obtained by Fisher suffer from the same shortcomings as the results obtained by Katz.

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[8]One reason for this may be the difference in the estimating technique used in the two studies. One would intuitively expect a high degree of correlation between W_a and $\bar{W}$, though neither study mentions this. This implies a high degree of multicollinearity in the model and the data correlation matrix will be ill-conditioned. To compensate for this, Katz uses a version of the Longley Normalized Modified Gram-Schmidt Algorithm. It appears that Fisher makes no such effort to compensate for any multicollinearity.

Table 2-3

Estimated Regression Coefficients: Fisher's Demand Equation

	a	b_1	b_2	b_3	b_4	b_5	b_6	b_7	R^2
White Males 14-19	-6.34 (4.78)	-1.96 (2.92)	.26 (1.06)	.89 (3.65)	.23 (1.72)	.47 (1.31)	1.57 (5.93)	.....	.96
White Females 14-19	-5.23 (3.90)	-1.78 (2.91)	.005 (.02)	.91 (2.36)	.24 (1.01)	.47 (1.02)	1.24 (.81)	.....	.96
Nonwhite Males 14-19	-5.70 (2.40)	-2.59 (2.43)	-1.02 (2.10)	1.02 (.38)	1.15 (3.61)	.29 (.33)	.81 (7.81)	- .13 (.52)	.88
Nonwhite Females 14-19	- .37 (.15)	-1.29 (1.17)	-1.11 (2.16)	1.05 (.81)	.36 (.86)	-1.11 (1.32)	.55 (4.39)	- .06 (.20)	.87

SOURCE: Alan Fisher, "The Problem of Teenage Unemployment," (Ph.D. dissertation, University of California, Berkeley, 1973), p. 120, Table 3-8.

In summary, then, only one of the studies have been able to demonstrate a relationship between the demand for youth labor and the minimum wage. However, four of the studies found a strong relationship between the youth wage, the adult wage and the demand for youth labor. The demand for youth labor increases as the wage for a substitute labor input increases, and decreases as the wage rate for youth increases. However, in those studies where an underlying theory could be established, the values of some of the coefficients in the models were found to be questionable.

2.3 The Labor Force Participation of Youth

During the past fifteen years there has been a virtual deluge of studies which have dealt with the labor force participation of various demographic groups. Only a very small number of these studies have dealt specifically with youth. The vast majority of the studies have examined the labor force participation of youth along with the labor force participation of a number of other demographic groups. It appears that the most efficient way to deal with such a large body of literature is to divide the review into a discussion of the "discouraged workers effect and the added worker effect" and "the income effect and the substitution effect."[9]

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[9] The income and substitution effects and the added and discouraged worker effects can be given concise, if not somewhat imprecise, definitions. Elementary price theory

2.3.1 The added and discouraged worker effects

An impressively large number of studies have examined the relationship between labor force participation of demographic groups and labor market conditions. The vast majority of such studies have simply included some measure of labor market conditions in a model which attempts to explain labor force participation. The partial regression coefficient of labor force participation on labor market conditions measures the net effect of the added and discouraged worker effects. That is to say, there is no attempt to separate the discouraged worker effect from the added worker effect.

Most of the studies reviewed in this subsection

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dictates that as the price of a good increases, consumers tend to buy less of that good. Since the opportunity cost of leisure is the wage rate, as the wage rate for youth increases, youth will tend to substitute away from leisure. This has been traditionally called the substitution effect. Likewise, elementary price theory dictates that as income increases, consumers will increase their consumption of superior goods. Assuming leisure is a superior good, as the wage rate for youth increases, he will tend to demand more leisure. This has traditionally been called the substitution effect.

The added worker and discouraged worker effects refer to the effect of labor market conditions on labor force participation. The former effect implies that during periods of high unemployment, there is an inflow of secondary workers into the labor market trying to supplement family income which has been temporarily reduced by the layoff of the primary worker. The latter effect implies that during periods of high unemployment, there is an outflow of secondary workers from the labor market because they become discouraged due to the difficulty of finding employment.

have been vigorously examined by Jacob Mincer.[10] Hence, there will be no attempt to duplicate his excellent review article. Primary attention will be given to the results of the studies and not to the methodology used.

Measures of the net outcome of the discouraged and added worker effects from five separate studies are recorded in Table 2-4. The studies include ones by Tella, Cooper and Johnston, Mincer, Dernburg and Strand, and Bowen and Finegan.[11] The first four of these studies relate the labor force participation rate of a demographic group to the ratio of the group's employment to the group's population. The Bowen and Finegan study relates the labor force participation rate of a demographic group to the total unemployment rate. The partial regression coefficient of labor force participation on the ratio of employment to population and the unemployment rate will be referred to as b_{le} and b_{lu}, respectively.

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[10]Jacob Mincer, "Labor-Force Participation and Unemployment: A Review of Recent Evidence," in Prosperity and Unemployment, ed. Robert Gordon and Margaret Gordon (New York: John Wiley and Sons, Inc., 1966), pp. 73-112.

[11]For a complete discussion of these studies, see Alfred Tella, "Labor Force Sensitivity to Employment by Age, Sex," Industrial Relations 4 (February 1965): 454-469; S. Cooper and D. Johnston, "Labor Force Projections 1970-1980," Monthly Labor Review 88 (February 1965): 129-140; Jacob Mincer, pp. 73-112; T. Dernburg and K. Strand, "Hidden Unemployment," unpublished manuscript, 1965; and William Bowen and Aldrich Finegan, The Economics of Labor Force Participation (Princeton, N.J.: Princeton University Press, 1969).

Table 2-4

Labor Force Participation Sensitivity Coefficients

	Tella[a]	Cooper and Johnston[b]	Mincer[c]	Dernburg and Strand[b]	Bowen and Finegan[d]	Bowen and Finegan[e]
	b_{le}	b_{le}	b_{le}	b_{le}	Time Series	Cross Section
					b_{lu}	b_{lu}
Males						
14-19	.36	.58	.28	.70	.....	.....
16-17	...	...	...	...	-1.61	-2.01
18-19	...	...	...	...	-0.84	-1.30
20-24	.46	.46	.37	.26	-0.41	-0.33
25-34	.20	.23	.17	...	.....	-0.33
35-44	.07	.00	.00	...	.....	-0.35
45-54	.14	.18	.14	.07	.....	-0.53
55-64	.46	.24	-.16	-.31	.....	-1.27
65+	.74	.88	.40	.74	-0.49	-1.34
Females						
14-19	.40	.74	.41	.93	.....	.....
16-17	...	...	...	...	-1.46	-1.06
18-19	...	...	...	...	-0.46	-0.40
20-24	.44	.59	-.15	.42	.....	-0.67
25-34	.52	...	...	.46	-0.25	-0.84
35-44	.51	.71	.00	.57	-0.25	-1.00
45-54	.69	.94	.72	.68	-0.18	-1.01
55-64	.63	.74	.26	.88	-0.41	-0.87
65+	.70	.99	.60	.86	-0.20	-0.58

[a]Adapted from Alfred Tella, "Labor Force Sensitivity to Employment by Age, Sex," Industrial Relations 4 (February 1965): 74, Table 1.

[b]Adapted from Jacob Mincer, "Labor-Force Participation and Unemployment: A Review of Recent Evidence," in Prosperity and Unemployment, ed. Robert Gordon and Margaret Gordon (New York: John Wiley and Sons, Inc., 1966), p. 86, Table 1. The partial regression coefficient for the Cooper and Johnston study were derived by Mincer from S. Cooper and D. Johnston, "Labor Force Projections 1970-1980," Monthly Labor Review 88 (February 1965), p. 138, Table 5. The partial regression coefficients for the

Table 2-4
(Continued)

Dernburg and Strand study were reproduced from T. Dernburg and K. Strand, "Hidden Unemployment," unpublished manuscript, 1965.

[c]Adapted from Mincer, p. 88, Table 2. The partial regression coefficients are the partial regression coefficients from Cooper and Johnston and are "corrected" by Mincer to isolate only those labor force changes which are in response to cyclical fluctuations in employment.

[d,e]Adapted from William Bowen and Aldrich Finegan, The Economics of Labor Force Participation (Princeton, N.J.: Princeton University Press, 1969), p. 513, Table 16-1.

[d]Estimated from regressions for 1954-IV Through 1965-III by Bowen and Finegan.

[e]Estimated from intercity regressions by Bowen and Finegan.

As can be readily observed from Table 2-4, for males, the relationship between age and the sensitivity of labor force participation to labor market conditions tends to be U-shaped. Moving from the bottom of the age ladder, the absolute value of the coefficient tends to steadily decrease until a trough is reached. The trough occurs at the 25-34 or 35-44 age group. Thereafter, the absolute value of the coefficient steadily increases.

It is possible to use the coefficients of Table 2-4 to calculate rough estimates of the relative labor force sensitivity of youth to labor market conditions. Table 2-5 records the ratios of B_{le} for the 14-19 year old group to b_{le} for each of the remaining age groups for the first five studies. In general, the relationship between age and the relative sensitivity of youth labor market conditions has the expected inverted U shape. Moving from the bottom of the age ladder, the absolute value of the ratio tends to steadily increase until a peak is reached for the 35-44 age group. Thereafter, the absolute value of the ratio steadily decreases. That is to say, the sensitivity of youth is greater relative to the middle age groups than the outlying age groups.

Rough estimates of the relative labor force sensitivity of youth to labor market conditions derived from the coefficients estimated by Bowen and Finegan are given

Table 2-5

Relative Labor Force Participation
Sensitivity Coefficients[a]

	Tella	Cooper and Johnston	Mincer	Dernburg and Strand
Males				
20-24	0.78	1.26	0.76	2.69
25-34	1.80	2.52	1.65	....
35-44	5.14	....	....	....
45-54	2.57	3.22	2.00	10.00
55-64	0.78	2.42	-1.75	- 2.26
65+	0.49	0.66	0.70	0.95
Females				
20-24	0.91	1.25	-2.73	2.21
25-34	0.77	....	....	2.02
35-44	0.78	1.04	....	1.63
45-54	0.58	0.79	0.57	1.37
55-64	0.63	1.00	1.58	1.12
65+	0.57	0.75	0.68	1.08

[a]For an explanation of sources, see Table 2-4.

in Table 2-6. The relative measures of labor force sensitivity for 16-17 and 18-19 year old youth were computed in a manner analogous to those given in Table 2-5. The relationship between age and the relative sensitivity of youth to labor market conditions is steadily downward sloping. That is, the sensitivity of youth to labor market conditions is greater relative to the groups on the lower rungs of the age ladder than those on the upper rungs.

As can be observed from Table 2-4, the relationship between labor market sensitivity and age is much more irregular in the case of females than in the case of males. In general, as one moves up the age ladder, the coefficient decreases and then increases at an earlier age than in the case of males. The age at which the trough occurs corresponds approximately to the age when a large percent of married females are involved in child-rearing activities. As the work of Becker and Cain indicates, market produced goods may be poor, or at least very costly, substitutes for a mother's own time. It is to be expected, then, that she would be less sensitive to labor market conditions. The increase in the coefficient tends to correspond to that period in the married woman's life cycle when she is free of many child-rearing activities. Market produced goods may

Table 2-6

Relative Labor Force Participation Sensitivity Coefficients: Bowen and Finegan[a]

	Time-Series		Cross-Sectional	
	16-17 Years Old	18-19 Years Old	16-17 Years Old	18-19 Years Old
Males				
20-24	3.93	2.05	6.09	3.94
25-34	....	....	6.09	3.94
35-44	....	....	5.74	3.71
45-54	....	....	3.79	2.45
55-64	....	....	1.58	1.02
65+	3.49	1.71	1.50	0.97
Females				
20-24	....	....	2.65	0.60
25-34	5.84	1.84	1.26	0.48
35-44	5.84	1.84	1.06	0.40
45-54	8.11	2.56	1.05	0.40
55-64	3.56	1.12	1.22	0.46
65+	7.30	2.30	1.83	0.69

[a]For an explanation of sources, see the notes to Table 2-4.

then be substituted for her own time in the home. Hence, she would be more sensitive to labor market conditions.[12]

There appears to be little concensus among the studies on the relative sensitivity of female youth to labor market conditions. The study by Tella indicates that female youth are less sensitive to labor market conditions than other females, while studies by Dernburg and Strand and Bowen and Finegan indicate they are more sensitive. Since married and single females respond differently to labor market conditions, these differences may be explained by the percent of single females in the samples used in the studies. However, all the studies appear to indicate that, relative to other females, female youth are much less sensitive to labor market conditions than male youth are relative to other males.

In summary, youth tend to be one of the most sensitive demographic groups. It appears that female youth are more sensitive than male youth. However, relative to other males, male youth tend to be far more

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[12] I do not propose a complete discussion of the theory of labor force participation of married women. For a complete discussion, see Glen Cain, Married Women in the Labor Force: An Economic Analysis (Chicago: The University of Chicago Press, 1966); or Jacob Mincer, "Labor Force Participation of Married Women: A Study of Labor Supply," in Aspects of Economics (Princeton, N.J.: Princeton University Press, 1962), pp. 63-97.

sensitive than female youth relative to other females. Other studies, not reviewed here, tend to strongly support this conclusion.[13]

2.3.2 The income and substitution effect

To my knowledge only five studies have examined the relationship between the youth wage rate and the labor force participation of youth. The majority of these studies simply include some measure of the wage rate in a model which attempts to explain the labor force participation of youth. The partial regression coefficient of labor force participation on the wage rate measures the net outcome of the income and substitution effects. That is to say, there is no attempt to separate the income effect from the substitution effect.

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[13]A number of other studies have also observed the relationships discussed in this section. Among others, see William Bowen and T. A. Finegan, "Labor Force Participation and Unemployment," in Employment Policy and the Labor Market, ed., Arthur Ross (Berkeley: University of California Press, 1965), pp. 115-161; Thomas Dernburg and Kenneth Strand, "Hidden Unemployment 1953-62: A Quantitative Analysis by Age and Sex," The American Economic Review 56 (March 1966): 71-95; Glen Cain, "Unemployment and the Labor-Force Participation of Secondary Workers," Industrial and Labor Relations Review 20 (June 1967): 275-297; and Kenneth Strand and Thomas Dernburg, "Cyclical Variation in Civilian Labor Force Participation," The Review of Economics and Statistics 46 (November 1964): 378-391.

Lerman has provided an exhaustive study of the labor force participation of youth. However, only in one case does he attempt to separately estimate the income effect and the substitution effect.[14] He finds both to be negative and insignificant at an acceptable level. Since economic theory stipulates that the substitution effect must be positive, his results must be rejected.

Katz and Fisher both included a labor force participation equation in their systems of simultaneous equations.[15] In both studies the partial coefficient of labor force participation on the average youth wage was insignificant for all cases considered.

Mincer has investigated the relationship between the labor force participation of youth and the minimum wage. Using the Almon distributed lag method, he attempts to explain labor force participation of youth in terms of a measure of the minimum wage and unemployment rate of adult males. The model was estimated using quarterly data from 1954 to 1969. He finds the minimum wage measure

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[14] Robert Lerman, "An Analysis of Youth Labor Force Participation, School Activity, and Employment Rates," (Ph.D. dissertation, Massachusetts Institute of Technology, 1970), p. 243.

[15] Arnold Katz, "State Minimum Wages and Labor Markets for Youth, " p. 13; and Alan Fisher, "The Problem of Teenage Unemployment," p. 120.

to be significant for both whites and nonwhites 16-19 years of age. He estimates wage elasticities of -.16 and -.37 for whites and nonwhites, respectively.[16] Unfortunately, Mincer presents only summary statistics, so no serious evaluation of the model can be attempted.

Bowen and Finegan provide, perhaps, the most reliable estimates of the net effect of the income effect and substitution effect for youth. The partial regression coefficient of labor force participation of youth on youth earnings was -.76 for 16-17 year old males, -.74 for 18-19 year old males and -.73 for 16-17 year old females. No results were reported for 18-19 year old females.[17] This implies that in all cases, the income effect swamps the substitution effect. That is, as wage rates increase, youth will supply a decreasing level of labor services to the market sector.

In summary, only Mincer and Bowen and Finegan have successfully estimated the net effect of wage rate changes

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[16] Jacob Mincer, "Unemployment Effects of Minimum Wages," p. 26, Table 2.

[17] William Bowen and Aldrich Finegan, The Economics of Labor Force Participation, pp. 778-830, Table B-1 - Table B-41. The coefficients cited for males are an average for youth enrolled in school and youth not enrolled. The coefficients cited for females include only single females.

on youth labor force participation. Bowen and Finegan found in all cases considered, the income effect swamps the substitution effect for average wage rate changes. Mincer found that the income effect swamps the substitution effect for changes in the minimum wage. It appears then, that no matter which wage rate is evaluated, youth respond negatively to increases in the wage rate.

2.4 Youth Unemployment

All the studies to be reviewed in this subsection have attempted to establish some form of relationship between youth unemployment and the minimum wage. All but one of the studies attempt to estimate an unemployment function of the form of equation (2-5). The estimated coefficients of such a function can be interpreted as the net outcome of the supply and demand response as discussed in the previous two subsections.

2.4.1 Studies using a comparative methodology

Yale Brozen compares the unemployment rate for all youths in the month when a change in the level of the federal minimum wage occurred to the rate in the previous month.[18] He finds that the youth unemployment rate

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[18] Yale Brozen, "The Effect of Statuatory Minimum Wage Increases on Teen-age Employment," Journal of Law and Economics 12 (April 1969): 109-122.

increases in six out of eight cases. If the youth unemployment rate always went up from month to month, such a comparison would prove nothing. However, during the period of analysis (1948-1968), the youth unemployment rate increased in only 111 out of 240 months. Brozen concludes that the increase in the youth unemployment rate in the months when the federal minimum wage was increased occurred too often to be coincidence. However, in a number of cases, the difference between the youth unemployment rate in the month when a change in the level of the federal minimum wage occurred and the youth unemployment rate in the previous month does not appear to be significant. Also, out of the eight cases, total unemployment increased five times, suggesting that factors other than the minimum wage increases were responsible for the increases in youth unemployment.

Brozen attempts to remove the impact of cyclical effects on youth unemployment by comparing the ratio of youth unemployment to total unemployment in the year preceding and the year following an increase in the minimum wage. The ratio increased in six out of seven cases. Using BLS data, the ratio of the youth unemployment rate to the unemployment rate for workers 25 years old and older increased in 13 out of the 20 years. However, two points should be noted. First, the ratio does not remove the impact of other secular changes. Second, cyclical effects cannot be removed by using the ratio of youth unemployment to total unemployment. As Perry has noted, the same unemployment rate at different points in time may be associated with different levels of aggregate demand.[19]

2.4.2 Studies using a binary variable for minimum wage changes

Four studies utilize a model that contains a binary variable to represent changes in the level of the federal minimum wage. The models of Easley and Fearn, Scully, and Folk can be generalized in the form,[20]

$$U_{it} = a + b_1 U_{at} + \sum_{j=2}^{n} b_j D_{jt} + \sum_{k=n+1}^{m} b_k I_{kt} + b_{m+1} T_t + e_t \qquad (2\text{-}17)$$

where,

U_i is the unemployment rate for the ith sex/color/age/enrollment youth group

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[19] George Perry, "Changing Labor Markets and Inflation," Brookings Papers on Economic Activity (1970): 411-441.

[20] James Easley and Robert Fearn, "Minimum Wages and Unemployment of Teenagers,"North Carolina State University, 1969. (Mimeographed.); Gerald Scully, "The Impact of Minimum Wages on the Unemployment Rates of Minority Group Labor," Ohio University, 1968. (Mimeographed.); and Hugh Folk, "The Problem of Youth Unemployment," in The Transition from School to Work, A Report Based on the Princeton Manpower Symposium, May 9-10, 1968 (Princeton: Princeton University, 1968), pp. 76-106.

U_a is the unemployment rate of some adult group

D is a set of binary variables or quasi-dummy variables for each statutory minimum wage level applicable to a particular period of of time

I is a set of other "relevant" variables

T is a linear trend term

e is an error term

Ignoring variables other than adult unemployment and the binary variable for the minimum wage, one would have,

$$U_{it} = (a + b_j) + b_1 U_{at} + e_t \tag{2-18a}$$

during the period with the j-1 change in the minimum wage and,

$$U_{it} = a + b_1 U_{at} + e_t \tag{2-18b}$$

for those periods when there were no changes in the minimum wage or the level was not applicable.

All of the models used in these studies can be generalized to the form of equation (2-17). However, all of the studies differ in some way from each other. For this reason, each study will be briefly discussed separately. Criticisms applicable to all of the studies will be retained until the end of the discussions.

Folk uses a single binary variable (n - 1 = 1) that takes the value one in periods when the minimum wage was increased, and zero otherwise. He does not include a set of other "relevant" variables. The parameters of the model were estimated using ordinary least squares with monthly data. In five out of eight cases, the unemployment rate of adults was significant at the .05 level. The trend term was always significant and the binary minimum wage variable never was. Folk rejects the hypothesis that the minimum wage has an impact on the level of youth unemployment.

The use of only one binary minimum wage variable is a questionable specification of the model. During the period of time the model was run, there were six changes in the minimum wage and/or minimum wage coverage. Some of these changes may or may not have had an impact on youth unemployment. Some changes may have had a great impact, while some may have had little. The use of a single binary variable mixes these different impacts into a single measure. A correct specification would include six binary variables, one for each change in the minimum wage. Also, the binary variable assumes the value one only during the year the minimum wage was changed. This implies very strange behavior on the part of youth and employers. It is doubtful that after the passage of one year the minimum will any longer be "effective".

The Easley and Fearn model uses four binary variables to capture the impact of five changes in the level of the minimum wage. They also include binary variables for the extension of coverage effective in 1961 and 1967 and the proportion of teenagers in the labor force in some of their regressions. The inclusion of the latter variable should have had a significant effect on the nature of their model. It treats the supply of youth labor as being exogeneously determined. They also exclude the trend term from the equations they estimated. Their results indicate that both the level and the extent of coverage of the minimum wage have had significant adverse effects on the unemployment of youth.

The Scully model utilizes a set of quasi-dummy variables for periods when the minimum wage was raised. No other variables were included in the analysis, except the unemployment rate of adults. The minimum wage variables were significant in four out of five cases.

The specification of the binary minimum wage variable in the Easley, Fearn and Scully studies corrects for the deficiencies noted in the binary variable specified in the Folk model. Each change in the minimum wage variable is specified separately and its impact is felt until the next change in the minimum wage. However, the use of a binary variable fails to account for the possible deterioration of the minimum wage over time or the lagged response of employers and youth to minimum wage changes. The full impact of a minimum wage change may not be felt for several months or, as some studies suggest, several years later. After some point, its impact can be expected to diminish as money wages increase and/or youth productivity increases over time. The use of a binary variable fails to capture these effects. If the binary variable takes the value one only in the current period, then it fails to capture the effect of the minimum wage as youth and employers adjust to it over time. If it retains the value one for some discrete time period following the minimum wage change, then it cannot capture the influence of rising money wages and/or rising youth productivity over time. The Scully model may partially correct for this with the use of quasi-dummy variables, but dummy variables are ill-suited for this purpose.

It is doubtful that the adult unemployment rate used by Easley and Fearn can be considered as being exogeneously determined. Many workers in such a heterogeneous group can be expected to be affected by the minimum wage. Scully uses the unemployment rate for adult males, but this too is a highly heterogeneous group with many members that can be expected to be affected by the minimum wage. Folk uses the unemployment rate for prime age white males, which is probably the best measure of the three.

All three models implicitly assume that the minimum wage affects only the intercept of the unemployment function and not its slope (see equations (2-18a) and (2-18b)). That is to say, at all levels of adult unemployment the minimum wage increases youth unemployment by some constant, b_j. However, given increasing adult wages, nonwage hiring costs and vacancies as adult unemployment decreases, one would expect the minimum wage to have much less of an impact at low levels of adult unemployment. Ignoring variables other than adult unemployment and the binary variable for the minimum wage, a more logical specification would seem to be,

$$U_{it} = a + b_1 U_{at} + \sum_{j=2}^{n} (b_j D_j + b_{j+n-1} D_j U_{at}) + e_t \qquad (2\text{-}19)$$

Then one would have,

$$U_{it} = (a + b_j) + (b_1 + b_{j+n-1}) U_{at} + e_t \qquad (2\text{-}20a)$$

during the period with the j-1 change in the minimum wage and,

$$U_{it} + a + b_1 U_{at} + e_t \qquad (2\text{-}20b)$$

during a period with no change in the minimum wage.

2.4.3 Continuous minimum wage variable

In an effort to correct some of the problems associated with using a binary variable to capture the effect of the minimum wage, most of the more recent studies use a continuous minimum wage variable. The basic model utilized in most of these studies can be written in the form,

$$U_{it} = a + b_1 V_t + b_2 MW_{t-h} + \sum_{j=3}^{n} b_j I_{j-2} + e_t \qquad (2\text{-}21)$$

where,

V is some measure of the overall level of economic activity or labor market conditions. In most studies it is the unemployment rate of some adult group

U_i is the unemployment rate or ratio of the ith sex/color/age youth group

MW is some measure of the level of the minimum wage

I is a set of other "relevant" variables

h is some lag factor

e is an error term

The eight studies reviewed in this section differ as to the measurement of economic activity used, the measurement of the level of the minimum wage used and the other "relevant" variables that are included in the analysis.[21]

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[21] The eight studies include ones by Douglas Adie, "The Lag in Effect of Minimum Wages on Teenage Unemployment," Industrial Relations Research Association, Proceedings of the 24th Annual Meeting (Madison: n.p. 1971), pp. 38-46; Douglas Adie, "Teen-age Unemployment and Real Federal Minimum Wages," Journal of Political Economy 81 (March/April 1973): 435-441; Douglas Adie and Gene Chapin, "Teen-age Unemployment Effects of Federal Minimum Wages," Industrial Relations Research Association, Proceedings of the 23rd

Studies by Adie (1971), Adie and Chapin, the Bureau of Labor Statistics, Burns and Moore use the unemployment rate of some adult group as a measure of the level of economic activity. It was noted earlier that the more heterogeneous the group whose employment rate is used, the greater the problems associated with using that rate as a measure of the level of economic activity. Consider the civilian unemployment rate used by Adie (1971), and Adie and Chapin. First, the inclusion of the youth labor force on both sides of the equation to be estimated creates spurious correlation. Since,

$$U_y = u_y/L_y \qquad (2\text{-}22)$$

and,

$$U_{y+a} = (u_y + u_a) / (L_y + L_a) \qquad (2\text{-}23)$$

Annual Meeting (Madison: n.p., 1970), pp. 117-127. Arthur Burns, unpublished regressions, referred to in Arthur Burns, The Management of Property (New York: Columbia University Press, 1966), pp. 45-48; Michael Lovell, "The Minimum Wage, Teenage Unemployment, and the Business Cycle," Western Economic Journal 11 (December 1973): 529-537; Thomas Moore, "The Effect of Minimum Wages on Teenage Unemployment Rates," Journal of Political Economy 79 (July/August 1971): 897-902; and U.S. Department of Labor, Bureau of Labor Statistics, Youth Unemployment and Minimum Wages (Washington: U.S. Government Printing Office, 1970), pp. 30-54.

where L is the civilian labor force, u is civilian unemployment, U is the civilian unemployment rate, and the subscripts y and a refer to youth and adults, respectively. One would expect to find a linear relationship between U_y and U_{y+a} without reference to any economic theory simply because u_y and L_y appear in the numerator and the denominator of both measures. Also, as u_y and L_y increase relative to u_a and L_a, the correlation between U_y and U_{y+a} will increase. Second, many workers other than youth can be expected to be affected by the minimum wage. Such disemployed workers can be expected to compete with youth for jobs in the uncovered sector of the market. If employers have a preference for adults over youth, this means that the probability of any youth finding a job will be decreased. Thus, including workers disemployed by the minimum wage means that b_1 will be measuring the indirect impact of the minimum wage on youth unemployment as well as other cyclical and secular effects. Burns, Moore and the BLS attempt to reduce the indirect impact by using the adult male unemployment rate. However, this is still a very heterogeneous group with many members who may be affected by the minimum wage.

Lovell (1972) and Adie (1973) use, respectively, the gap between potential and actual GNP and a final product index of industrial production as a measure of the level of economic activity in an effort to avoid the problems associated with the use of an unemployment rate. It was shown earlier that equation (2-21) is a reduced form of some structural system that includes a supply equation and a demand equation. The measure of the level of economic activity enters the supply function and the demand function Thus, b_1 measures both a supply response and a demand response. The problem, then, is specifying a measure of economic activity that would work equally well in both functions. An unemployment rate which measures the "added worker" and "discouraged worker" effect is obviously the correct measure for the supply equation. The unemployment rate is also the correct measure for the demand equation as long as one assumes inflexible wages.[22] However, since we are testing for the impact of one source of wage inflexibility, this may be an assumption we do not want to make. The best measure for the demand equation is some measure of aggregate demand or output. The question, then, is selecting between these two measures, one which is preferable

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[22]Given inflexible wages, some significant level of unemployment and an elastic supply of youth and adult labor, employers will prefer to hire adults (given that adults are more productive) and youth will be disproportionately concentrated among the unemployed. As full employment is approached, employers will find it increasingly costly to insist on adult labor, due to increasing vacancies, recruiting expenditures and adult wages, and youth employment will expand.

in the supply equation and one which is preferable in the demand equation.[23] Since both are deficient in one equation, the selection is largely a matter of taste.

The measurement of the minimum wage also creates potentially serious problems. The eight studies use three distinct measures of the real minimum wage.

a. MW/AHE

b. MW/P

c. (MW/AHE) (C)

where, MW is the real minimum wage, P is the consumer price index or the wholesale price index, AHE is the average hourly earnings of production workers, and C is some measure of the extent of minimum wage coverage. Adie (1971), Moore and Burns use measure a, Adie (1973) and Chapin and Adie use measure b, and Lovell and the BLS use measure c.

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[23]The unemployment rate may be the better of the two even if one does not assume inflexible wages. Youth are typically part-time, part-year workers. Those who are full-time workers characteristically have high quit rates. This means, at any point in time youth account for a disproportionate share of job hunters. If the probability of a job hunter finding employment is inversely related to the unemployment rate, youth employment will increase as the unemployment falls. It should be noted that this does not mean that the unemployment rate is the best measure for the demand equation, but _may be_ the best for the reduced form equation.

The correct specification of a real minimum wage is highly relevant to the concept of the deterioration of the "effectiveness" of the statutory minimum wage over time. The correct measure of the effectiveness of the minimum wage is the ratio of the minimum wage to the market wage that would prevail in the absence of a minimum wage. Given a negatively sloped demand curve and a positively sloped supply curve, the greater the difference between the minimum wage and the market wage that would have prevailed, the greater the resulting unemployment. Since the mean market determined wage cannot be observed in the presence of an effective minimum wage, the use of any deflator is a matter of taste.[24] However, the proxy that is used for the mean market determined wage should be one that has grown at the same rate as the unobserved market wage. This means that the minimum wage deflated by the proxy will differ from the real minimum wage by some multiplicative constant. However, it is difficult to conceive of a measure which would move with the youth market wage. During the rapid youth population growth of the mid-sixties, it is conceivable that the market wage would not have increased in spite of inflation and youth productivity growth.

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[24]For a more complete discussion, see Alan Fisher, "The Minimum Wage and Teenage Unemployment: A Comment on the Literature," Western Economic Journal 11 (December 1973): 516.

Some variable which measures the impact of changes in coverage must obviously be included in any model which attempts to establish an empirical relationship between youth unemployment and the level of the minimum wage. An increase in the minimum wage under very limited coverage can be expected to have much less of an impact on youth employment opportunities than an increase under universal coverage. In the former case, workers who were released by covered firms could find employment at some wage in the uncovered sector. Such opportunities obviously do not exist in the presence of universal coverage.

Two of the studies use a measure of the minimum wage which includes a coverage "adjustment" which was constructed by the BLS.[25] Ignoring newly covered workers whose minimum wage is below the existing statutory minimum, the measure can be written as,

$$CMW = E_j \,/\, TE\ (MW \,/\, AHE_j)\ C_j \tag{2-24}$$

where,

CMW is a measure of the real minimum wage adjusted for the extent of coverage

E_j is the total payroll employment in the jth industry

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[25]For a more complete description of the measure, see Bureau of Labor Statistics, pp. 12-14.

TE is the total payroll employment in the private nonfarm economy

WM is the statutory minimum wage

AHE_j is the average hourly earnings in the jth industry

C_j is the proportion of nonsupervisory employers covered by the basic minimum in the jth industry

Without dwelling too long on equation (2-24), four major problems can be quickly enumerated. First, as it was noted previously, it is very doubtful if AHE is the proper deflator for the minimum wage. Second, the measure includes all workers and not just youth. The extension of coverage to firms employing primarily adults can be expected to have much less of an impact on youth unemployment than the extension of coverage to firms employing large numbers of youth. Third, the measure treats an increase in the number of workers covered in the same manner as an increase in the minimum wage. It is doubtful that an increase in the minimum wage will have the same effect as an extension of coverage. Yet, in the composite measure, the two changes are indistinguishable. Fourth, the measure excludes those workers who become disemployed because of the minimum wage. Yet, it includes those workers whose wages were already above the minimum and were thus unaffected by it.

Of the eight studies which attempt to estimate an equation similar in form to equation (2-21), five specifically examine the nonlagged form; i.e., h = 0. In estimating the equation, the Bureau of Labor Statistics used the ratio of unemployed youth to the civilian youth population as the dependent variable. The use of the unemployment ratio as opposed to the unemployment rate circumvents the labor-force concept. The model included as independent variables the unemployment rate for adult males, minimum wage measure c and eight additional explanatory variables. In all cases, the minimum wage measure was either insignificant or of the wrong sign.

Because of the nature of the variables used in the regression analysis, the results of the BLS study are very difficult to interpret. The BLS justified the use of an unemployment ratio as opposed to an unemployment rate on the grounds that the latter is sensitive to the definition of the labor supply. During periods of high unemployment, some youth may be discouraged from looking for employment and thus, not be counted as being unemployed. This will tend to bias the unemployment rate downward. The extent of the bias will depend on the number of unemployed youth who withdrew from the labor force. However, it should be noted that when the number of unemployed youth increases and the number of youth in the labor force decreases because of discouragement, the unemployment rate will increase.[26] The unemployment ratio will also increase, but less than the unemployment rate as long as labor force withdrawal by the unemployed is not total. Hence, the unemployment ratio will understate the impact of minimum wage changes on youth unemployment.[27]

The inclusion of eight additional explanatory variables besides the minimum wage measure and the adult unemployment rate causes the greatest problems for meaningful interpretation. The inclusion of some of these additional variables can be justified. However, others simply do not belong. The most troublesome of these variables is the ratio of youth population to adult population. One would expect an increase in the relative supply of youth to have no impact on youth unemployment except in the presence of an inflexible youth wage. Including both a measure of wage

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[26] This is a rather tedious statement. It can be shown that if all workers who become unemployed during period t withdraw from the labor force at the end of period t + 1 and the number unemployed and employed is constant during period t + 1, then the unemployment rate will decrease from the start of period t + 1 to the start of t + 2.

[27] I believe Fearn was the first to point this out. See Robert Fearn, "Discussion," Industrial Relations Research Association, Proceedings of the 24th Annual Meeting (Madison: n.p., 1971), p. 140.

inflexibility (the real minimum wage) and the relative supply of youth is redundant. If both are included, one cannot evaluate the impact of the minimum wage on youth unemployment by examining the regression coefficients.[28] It should also be noted that the inclusion of the population ratio introduces spurious correlation. Youth population appears both in the denominator of the population ratio and the numerator of the unemployment ratio, biasing the coefficient toward a negative number.

The remaining models will be examined in their lagged form since it is doubtful if the adjustment by employers and youth to minimum wage changes is instantaneous. The two studies by Adie and the study by Adie and Chapin use the simplest specification of the lagged model. In these models the minimum wage variable is simply lagged

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[28]This problem has received a great deal of attention in the literature recently. See Douglas Adie and Lowell Galaway, "The Minimum Wage and Teenage Unemployment: A Comment," Western Economic Journal 11 (December 1973): 527; Alan Fisher, "The Minimum Wage and Teenage Unemployment: A Comment on the Literature," p. 520; and Michael Lovell, "The Minimum Wage Reconsidered," Western Economic Journal 11 (December 1973): 529-537. The study by Lovell includes two models similar to equation (2-21). One model includes a relative supply variable and the other excludes it. The former shows significant minimum wage impact, while the latter does not. Since the model is misspecified, this cannot be interpreted as evidence that the minimum wage does not cause youth unemployment. However, it should be noted that since none of the models use the correct deflator for the minimum wage, a relative supply variable may be a better measure of the impact of an inflexible wage structure on youth unemployment than the real minimum wage.

for a specified number of periods. Separate regressions are run for the minimum wage lagged 8, 16 and 24 months. The results of the models are rather puzzling, with the greatest impact not being felt until two years after the minimum wage is increased. Their specification of the model implies rather strange behavior on the part of employers and youth. For example, specifying a lag of 24 months implies that employers and workers respond to what the minimum wage was two years ago, but are indifferent to what it currently is, or what it was a month ago, or what it will be in one month.

Lovell (1972) and Adie (1971) use a distributed lag form of equation (2-21). Unfortunately, the results of all three models are highly questionable. Using an Almon distributed lag model, Adie derives unemployment elasticities with regard to the minimum wage. He finds that over 50 percent of the maximum unemployment effects of the minimum wage for white youth are felt after only eight months. Yet, for nonwhite youth, only 30 percent of the maximum unemployment effects are felt after eight months. One would expect the converse, and even then this implies very rapid adjustment on the part of employers and youth. For some of the sex/color groups, the results are even more disturbing. Given a ten percent increase in the real minimum wage, the unemployment elasticities imply that after sixty months, unemployment would increase 46 percent for nonwhite females, 26 percent for nonwhite males and 27 percent for white females. These are unbelievably large increases.

The study by Moore is the last one to be reviewed that estimates an equation similar to equation (2-21). The model developed by Moore utilizes a lagged minimum wage of the form,

$$MW_t = \frac{.75 + \sum_{k=1}^{t} (1-B^{t-k})\ \Delta M_k}{AHE_t} \qquad (2\text{-}25)$$

where \$.75 is the minimum wage in January 1954, the first month in the series of monthly observations, ΔM_k is the change in the minimum wage in the kth month, and AHE is the average hourly earnings of production or nonsupervisory workers on private nonagricultural payrolls. The parameter B was iterated from .10 to .99 to secure the best fit. The value of B which maximized the R^2 was found to be .95. This implies that 43.1 percent of the effect of changes in the minimum wage is felt after one year, 69 percent at the end of two years and 83 percent after three years.

The final form of Moore's model attempts to explain the unemployment rate of a given youth sex/color group in terms of the unemployment rate of males 25 years old and older, the percentage of workers covered by the minimum wage and MW_t. All regression coefficients in the model were significant at the .05 level, of the right sign, and of reasonable magnitude for the two color groups and the two sex groups specified. Assuming that the adult male unemployment rate is four percent, the percentage of workers covered by the minimum wage is 62, and AHE rises at six percent a year, under the 1968 provisions the estimated coefficients predict a steady fall in nonwhite youth unemployment from 1970 to 1974 with a low of 15.8 percent in 1974. These results are far more reasonable than the much larger effects found in other studies. Also, the longer adjustment period is much more reasonable than the rapid adjustment implied in the Adie and Lovell studies.[29]

2.4.4 Summary

In summary, there appears to be no consensus on the relationship between minimum wages and youth unemployment.

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[29]Two models, one by Lester Thurow, Poverty and Discrimination (Washington: The Brookings Institute, 1969) and one by Marvin Kosters and Finis Welch, "The Effects of Minimum Wages on the Distribution of Changes in Aggregate Employment," American Economic Review 62 (June 1972): 323-332, will not be discussed. The Koster and Welch study employs a nonlinear model. However, the theory underlying the model, though more closely tied in to the human capital approach, is similar to that developed in other models. Most of the general comments made in this section are applicable to their study. The study by Thurow utilizes a model that is only loosely tied in to any theory, making his results almost uninterpretable.

Both the studies that find a positive relationship between youth unemployment and the minimum wage, and those that find no relationship between the two have been shown to be severely deficient in some respects. Those studies which have found a relationship between minimum wages and youth unemployment differ as to the strength of the relationship. Most such studies have estimated unreasonably large responses in youth unemployment to minimum wage changes.

2.5 Summary and Conclusions

An attempt has been made in this chapter to provide a concise review of the evidence bearing on the demand for youth labor, the labor force participation of youth and youth unemployment. It was shown that the studies that examined youth unemployment actually estimated a "reduced form" equation that was derived from some underlying supply and demand function for youth labor. The studies that have specifically examined youth unemployment can provide no consensus on the direction and the strength of the unemployment response to minimum wage changes. However, it appears that the models used in these studies, when viewed as "reduced form equations", are terribly misspecified. There appears to be a misspecification of variables, as well as the form in which the equations are written.

More insight can be gained from the studies that have examined only the demand for youth labor or the labor force participation of youth than from the studies that have examined youth unemployment. It appears that the "income effect" dominates the "substitution effect" for both increases in the average youth wage and increases in the minimum wage. This conclusion was reached in both the Bowen and Finegan study and in the Mincer study. Other studies which have considered the labor force participation of youth have failed to find any significant relationship between wage rate changes and youth participation. In no case was the "substitution effect" found to dominate the "income effect."

All the studies that examined the labor force participation of youth reach unanimous agreement that the "discouraged worker effect" dominates over the "added worker effect." The studies differ as to the degree of sensitivity of youth to labor market conditions relative to other demographic groups. However, the majority of the studies conclude that youth are one of the most sensitive demographic groups. Female youth tend to be more sensitive than male youth, while male youth tend to be more sensitive relative to other males than female youth relative to other females.

All the studies that considered the demand for youth labor, with the exception of the Barth study, found that the demand for youth labor is highly sensitive to both the average youth wage and the minimum wage. As expected, the demand for youth decreases with increase in either the average youth wage or the minimum wage. Three studies included the wage rate of a substitute labor input in the demand for youth labor function. In all cases, it was found that an increase in the wage for the substitute labor input increases the demand for youth labor. However, in those studies where an underlying theory could be established, it was found that the magnitude of the estimated coefficients implied a negative output elasticity for youth.

The most obvious conclusion to be drawn from this review is that past attempts to estimate the "reduced form" unemployment function have been premature. Not enough is known about the determinants of youth labor demand and youth labor supply to permit the construction of a correctly specified unemployment function that includes the relevant variables from both the demand and the supply sides. Our knowledge seems especially deficient when it comes to the demand for youth labor. For example, consider the following questions: "What classes of labor can youth labor be substituted for?" "What is the elasticity of substitution between youth labor and other labor inputs?" "What is the output elasticity for youth labor?" "Does the output elasticity for youth labor vary between jobs covered by the minimum wage and those that are uncovered?"

At the present time, the current stock of knowledge is insufficient to provide answers to such questions. It is in this direction, then, that this study plans to move.

Chapter 3

THE DEMAND FOR YOUTH LABOR

It was noted in Chapter Two that the majority of the studies which have examined the labor market experience of youth have estimated either the structural equations or a reduced form equation of a youth labor supply and demand model. It was shown that a three equation structural system, which includes a youth labor demand equation, a labor force participation of youth equation and a youth unemployment equation, could underlie the general reduced form equation. The present chapter is devoted to an examination of the demand for youth equation. However, the demand function suggested here departs substantially from the demand function given by equation (2-1) or the demand functions used in any of the studies reviewed in Chapter Two. These demand functions related the total volume of youth labor demanded to a set of labor market variables. However, the demand function postulated in the present chapter takes total labor demand as given and concentrates on the proportion of total demand directed toward youth. Thus, one is not concerned with a total demand for labor function, but with a proportionate demand function.

The proportionate demand function is developed in Section 3.1. It is derived from the first order conditions for cost minimization for a single competitive firm and it assumes a linearly homogeneous production function of the generalized Cobb-Douglas variety. The proportionate demand functions for all firms in an economic region are aggregated in section 3.2 to form a meta proportionate demand function. The possibility of production functions other than the generalized Cobb-Douglas variety underlying the meta proportionate demand function and recent evidence on expected output elasticities are discussed in section 3.3. Section 3.4 includes a discussion of factors other than those included in the meta proportionate demand function that may have an impact on the proportion of total labor demand directed toward youth.

3.1 The Firm's Proportionate Demand Function

In deriving the firm's proportionate demand for labor function, it is assumed that there are m homogeneous classes of labor. Each of these homogeneous classes of labor is a unique and separable input to some production process. Assuming that there is only one unique and separable class of capital, there are then m + 1 inputs to the production process. The firm's linearly homogeneous production function can then be written in the form,

$$Q = a\left(\prod_{j=1}^{m} N_j^{\alpha_j}\right) K^k \tag{3-1}$$

where

Q is total output

N_j is the jth class of labor input

K is the stock of capital

For each of the m classes of labor, the firm is faced with m separate wage rates. It is further assumed that there is a single unique price for each unit of capital stock. The nature of the firm is such that its actions do not affect the price of capital, the price of its own product, nor any of the wage rates. The total cost equation for the firm can be written as,

$$C = \sum_{j=1}^{m} W_j N_j + pK \tag{3-2}$$

where,

W_j is the wage rate of the jth class of labor

p is the price per unit of the capital stock

C is the total cost for the firm

The firm's proportionate demand function can be derived from the firm's first order conditions for cost minimization.[1] Form the Lagrangian,

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[1]The form of the production function and the total cost equation implicitly assume that entrepreneurs have a one period time horizon. The possibility of intemporal optimizing behavior will be discussed in subsection 3.4.4.

$$V = \sum_{j=1}^{m} W_j N_j + pk - \lambda(Q - a(\prod_{j=1}^{m} N_j^{\alpha_j})\, K^k \qquad (3\text{-}3)$$

Taking the partial derivative of equation (3-3) with regard to each of the m + 1 factors of production and λ, the first order conditions for cost minimization are,[2]

$$\begin{aligned}
\partial V/\partial N_1 &= W_1 - \lambda(\alpha_1\, a\, N_1^{\alpha_1 - 1} (\prod_{j=2}^{m} N_j^{\alpha_j})\, K^k) = 0 && (3\text{-}4a)\\
&\vdots\\
\partial V/\partial N_i &= W_i - \lambda(\alpha_i\, a\, N_i^{\alpha_i - 1} (\prod_{j=1}^{m} N_j^{\alpha_j})\, K^k) = 0;\ i \neq j\\
&\vdots\\
\partial V/\partial N_m &= W_m - \lambda(\alpha_m\, a\, N_m^{\alpha_m - 1} (\prod_{j=1}^{m-1} N_j^{\alpha_j})\, K^k) = 0\\
\partial V/\partial K &= p - \lambda(k\, a\, K^{k-1} (\prod_{j=1}^{m} N_j^{\alpha_j})) = 0 && (3\text{-}4b)\\
\partial V/\partial \lambda &= -(Q - a(\prod_{j=1}^{m} N_j^{\alpha_j})\, K^k) = 0 && (3\text{-}4c)
\end{aligned}$$

The m + 1 cost minimizing demand equations for each of the m + 1 factor inputs can be solved for by using the m + 2 first order conditions for cost minimization. Solving for each of the m + 1 factor inputs in terms of the remaining m inputs and substituting successively into equation (3-4c) gives the m + 1 factor demand equations,[3]

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[2]Assuming that k, a and W_j are always positive and the level of factor inputs are always positive, the second order conditions for a minimum are also satisfied.

[3]For example, solve for N_2 in terms of N_1, N_3 in terms of N_1, etc. Substituting the m solutions into (3-4c) and solving for N_1 gives the optimal demand for N_1 in terms of α_j, k, Q, W_j and p.

$$N_1 = [a(\prod_{j=2}^{m} (\alpha_j/\alpha_1)^{\alpha_j})(k/\alpha_1)^k]^{-1/\beta} Q^{1/\beta} W_1^{-(\sum_{j=2}^{m} \alpha_j/\beta)} p^{k/\beta} (\prod_{j=2}^{m} W_j^{\alpha_j/\beta}) \qquad (3\text{-}5a)$$

$$\vdots$$

$$N_i = [a(\prod_{j=1}^{m} (\alpha_j/\alpha_i)^{\alpha_j})(k/\alpha_i)^k]^{-1/\beta} Q^{1/\beta} W_i^{-(\sum_{j=1}^{m} \alpha_j/\beta)} p^{k/\beta} (\prod_{j=1}^{m} W_j^{\alpha_j/\beta}) \; ; \; i \neq j$$

$$\vdots$$

$$N_m = [a(\prod_{j=1}^{m-1} (\alpha_j/\alpha_m)^{\alpha_j})(k/\alpha_m)^k]^{-1/\beta} Q^{1/\beta} W_m^{-(\sum_{j=1}^{m-1} \alpha_j/\beta)} p^{k/\beta} (\prod_{j=1}^{m-1} W_j^{\alpha_j/\beta})$$

$$K = [a(\prod_{j=1}^{m} (\alpha_j/k)^{\alpha_j})]^{-1/\beta} Q^{1/\beta} p^{-(\sum_{j=1}^{m} \alpha_j/\beta)} (\prod_{j=1}^{m} W_j^{\alpha_j/\beta}) \qquad (3\text{-}5b)$$

where,

$$\beta = k + \sum_{j=1}^{m} \alpha_j$$

Using the m + 1 factor demand equations, the cost minimizing proportionate demand equation for N_1 can be written in the form,[4]

$$N_1/\sum_{j=1}^{m} N_j = [1 + \sum_{j=2}^{m} [\alpha_j/\alpha_1][W_1/W_j]]^{-1} \qquad (3\text{-}6)$$

3.1.1 Interpretation of the firm's proportionate demand function

Letting N_1 be the number of youth demanded, equation (3-6) is the proportionate demand function for youth labor

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[4]It is interesting to note that the assumption of a single class of capital has not proved at all restrictive since capital does not enter the proportionate demand function.

for the individual firm. The α's in the firm's proportionate demand function for youth labor have a straightforward economic meaning. For example, the output elasticity of N_1 (ω_1) is defined as the proportionate rate of change of Q with respect to N_1, such that,

$$\omega_1 = (\partial Q / Q) \Big/ (\partial N_1 / N_1) = (\partial Q / \partial N_1) \Big/ (Q / N_1) \quad (3\text{-}7)$$

The numerator of the right most expression of equation (3-7) is the marginal product of N_1 and the denominator is the average product of N_1. In the case of a production function of the form of equation (3-1), the marginal product of N_1 is simply,

$$\partial Q / \partial N_1 = \alpha_1 \, a \, N_1^{\alpha 1-1} \left(\prod_{j=2}^{m} N_j^{\alpha j} \right) \quad (3\text{-}8)$$

and the average product of N_1 is,

$$Q / N_1 = a \, N_1^{\alpha 1-1} \left(\prod_{j=2}^{m} N_j^{\alpha j} \right) \quad (3\text{-}9)$$

Substituting equation (3-8) and equation (3-9) into equation (3-7), the output elasticity of N_1 is α_1. In general, then, considering all labor inputs, it can be shown that $\omega_j = \alpha_j$.

The α's also have another closely related interpretation. Euler's theorem states that the following condition is satisfied by a linear homogeneous production function:[5]

$$\sum_{j=1}^{m} (\partial Q \,/\, \partial N_j)\, N_j + (\partial Q \,/\, \partial K)\, K = Q \qquad (3\text{-}10)$$

Dividing equation (3-10) through by Q gives,

$$\sum_{j=1}^{m} \alpha_j + k = 1 \qquad (3\text{-}11)$$

If each factor is paid its marginal product, total output is distributed among the factors of production in the proportions given by equation (3-11). That is to say, α_j can be interpreted as the jth class of labor's share of total output. Likewise, since $\alpha_j = \omega_j$, the sum of the output elasticities is equal to 1 - k. That is to say, there are constant returns to scale.

The proportionate demand function for youth labor for the individual firm can now be interpreted in a straightforward manner. It should be fairly obvious that an increase in the youth wage with the remaining m - 1 wage rates held constant will result in a decrease in the proportion of youth labor demanded. However, the change in proportionate demand due to changes in relative wages is dependent on

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[5] See, James Henderson and Richard Quandt, Microeconomic Theory: A Mathematical Approach (New York: McGraw-Hill Book Company, 1971), pp. 81-82.

relative output elasticities. If α_j is very small relative to α_1, then an increase in W_1 relative to W_j will result in only a small decrease in the proportionate demand for youth labor. However, if α_1 is very small relative to α_j, then the same relative increase in W_1 will result in a much larger decrease in proportionate demand.

3.2 The Meta Proportionate Demand Function

Equation (3-6) has been shown to be the proportionate demand function for an individual firm. Since the individual micro-proportionate demand functions are additively separable in their factor components, they can be used to derive a regional aggregate proportionate demand function.

It can be assumed that there are n firms in the region. The regional labor market is dichotomized into a regulated wage sector, which contains p firms, and an unregulated wage sector, which contains g firms. The dichotomization is assumed perfect, such that $n = p + g$. In the regulated wage sector, wages are set institutionally. They are set equal to or greater than some minimum established by law. Wages are set by the traditional competitive process in the unregulated wage sector.[6]

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[6] The dichotomous classification is a gross simplification since each sector is itself comprised of submarkets. Typically, the sectors would be delineated along job lines and not firm lines. Thus, a single firm may be in both sectors. However, it will be shown later that this is not a problem for the estimation of the meta proportionate demand function.

Equation (3-6) can be rewritten as,

$$\sum_{j=1}^{m} N_j = N_1 + N_1 \, [(\alpha_j \, / \, \alpha_1) \; (W_1 \, / \, W_j)] \tag{3-12}$$

Aggregating equation (3-12) over the p firms in the regulated wage sector and the g firms in the unregulated wage sector, respectively, gives,

$$\sum_{k=1}^{p} \sum_{j=1}^{m} N_{jk} = \sum_{k=1}^{p} N_{1k} \sum_{j=1}^{m} [\alpha_j \, / \, \alpha_1]_k \; [RW_1 \, / \, RW_j] \tag{3-13}$$

and,

$$\sum_{\ell=1}^{q} \sum_{j=1}^{m} N_{j\ell} = \sum_{\ell=1}^{q} N_{1\ell} \sum_{j=1}^{m} [\alpha_j \, / \, \alpha_1]_\ell \; [VW_1 \, / \, VW_j] \tag{3-14}$$

where,

RW is the institutionally determined wage

VW is the wage prevailing in the unregulated sector

k refers to the kth firm in the regulated sector and k = (1,...,p)

ℓ refers to the ℓth firm in the unregulated sector and ℓ = (1,...,g)

It should be noted that the wage rate ratios in equations (3-13) and (3-14) do not require subscripts. It is assumed that all firms in the regulated sector of the regional labor market are faced with the same institutionally determined wage structure. Likewise, it is assumed that all firms in the unregulated sector are faced with the same competitively determined wage structure. Equations (3-13) and (3-14) reduce to the same form as equation (3-12) only in the case where,

$$[\alpha_j / \alpha_1]_k = [\alpha_j / \alpha_1]_h \; ; \; k \neq h \tag{3-15}$$

$$[\alpha_j / \alpha_1]_\ell = [\alpha_j / \alpha_1]_h \; ; \; \ell \neq h \tag{3-16}$$

for all values of j and all pairwise comparisons between firms within sectors. Such a case would be very exceptional. It would effectively mean that all firms within sectors are identical.

Since it is expected that intrasector differences in α_j/α_1 will not be minimal, the ratios can be rewritten in the form,

$$[\alpha_j / \alpha_1]_k = \bar{\sigma}_j + \sigma^*_{jk} \tag{3-17}$$

$$[\alpha_j / \alpha_1]_\ell = \bar{\theta}_j + \theta^*_{j\ell} \tag{3-18}$$

where,

$\bar{\sigma}_j$ is the mean ratio of α_j to α_1 for the firms in the regulated sector

$\bar{\theta}_j$ is the mean ratio of α_j to α_1 for the firms in the unregulated sector

σ^*_{jk} is the deviation of the kth firm's ratio from the mean ratio for the firms in the regulated sector

θ^*_j is the deviation of the ℓth firm's ratio from the mean ratio for the firms in the unregulated sector

Using equations (3-17) and (3-18), equations (3-13) and (3-14) can now be re-expressed as,

$$\sum_{k=1}^{p} \sum_{j=1}^{m} N_{jk} = \sum_{k=1}^{p} N_{1k} \sum_{j=1}^{m} [\bar{\sigma}_j + \sigma^*_{jk}] [RW_1 / RW_j] \quad (3\text{-}19)$$

and,

$$\sum_{\ell=1}^{q} \sum_{j=1}^{m} N_{j\ell} = \sum_{\ell=1}^{q} N_{1\ell} \sum_{j=1}^{m} [\bar{\theta}_j + \theta^*_{j\ell}] [VW_1 / VW_j] \quad (3\text{-}20)$$

By combining equations (3-19) and (3-20) and rearranging terms, the two sector meta proportionate demand function can be specified as,

$$D = 1 + P_r \sum_{j=2}^{m} \beta_j [RW_1 / RW_j] + P_u \sum_{j=2}^{m} \gamma_j [VW_1 / VW_j] \quad (3\text{-}21)$$

where,

$$D = [\sum_{k=1}^{p} \sum_{j=1}^{m} N_{jk} + \sum_{\ell=1}^{q} \sum_{j=1}^{m} N_{j\ell}] / [\sum_{k=1}^{p} N_{1k} + \sum_{\ell=1}^{q} N_{1\ell}] \quad (3\text{-}22)$$

$$P_r = [\sum_{k=1}^{p} N_{1k}] / [\sum_{k=1}^{p} N_{1k} + \sum_{\ell=1}^{q} N_1] \quad (3\text{-}23)$$

$$P_u = [\sum_{p=1}^{q} N_{1\ell}] / [\sum_{k=1}^{p} N_{1k} + \sum_{\ell=1}^{q} N_{1\ell}] \qquad (3\text{-}24)$$

$$\beta_j = \bar{\sigma}_j + \sum_{k=1}^{p} [N_{1k} \quad (\sum_{k=1}^{p} N_{1k} + \sum_{\ell=1}^{q} N_{1\ell})] \; \sigma^*_{jk} \qquad (3\text{-}25)$$

$$\gamma_j = \bar{\theta}_j + \sum_{\ell=1}^{q} [N_{1\ell} \quad (\sum_{k=1}^{p} N_{1k} + \sum_{\ell=1}^{q} N_{1\ell})] \; \theta^*_{j\ell} \qquad (3\text{-}26)$$

D, P_r and P_u can be interpreted in a straightforward manner. D is the ratio of total labor demanded to youth labor demanded; P_r is the proportion of total youth labor demanded that is demanded by the regulated sector; and P_u is the proportion of total youth labor demanded that is demanded by the unregulated sector.

3.2.1 Interpretation of the meta proportionate demand function

The two sector meta proportionate demand function, as represented by equation (3-21), is readily interpretable. An increase in the regulated youth wage or the unregulated youth wage will result in a decrease in the proportion of total demand directed toward youth. The strength of the response is dependent on the distribution of youth labor demanded between the two sectors. For example, if a low proportion of the total demand for youth is located in the regulated sector, an increase in the regulated youth wage can be expected to have only a minimal impact on the proportion of total demand directed toward youth. Likewise, if a high proportion of the total demand for youth labor is located in the unregulated sector, an increase in the unregulated youth wage can be expected to have a great impact on the proportion of total demand directed toward youth.

The magnitude of the response of the proportion of total demand directed toward youth is also dependent on the values of β_j and γ_j. The value of β_j is dependent on $\bar{\sigma}_j$ as well as the values of σ^*_{jk} the ratio of the firm's demand for youth labor to the total youth labor demanded for the region and the degree of correlation between the two. Likewise, the value of γ_j is dependent not only on $\bar{\theta}_j$, but also on the values of $\theta^*_{j\ell}$, the ratio of the firm's demand for youth labor to the total youth labor demanded in the region and the degree of correlation between the two.

The relationship between σ^*_{jh} and the firm's proportion of total youth labor demanded can be illustrated by constructing a simple case. Consider the case of a homogeneous production function with two labor inputs. The first order cost minimizing conditions require,

$$(RW_1 \;/\; RW_j)\;(\alpha_j \;/\; \alpha_1) = N_j \;/\; N_1 \tag{3-27}$$

The wage ratio expression on the left can be treated as a constant for the firm. First, assume that firms in the region adjust to relative output elasticities by varying only N_j and hold youth employment constant. In such a case, σ^*_{jk} and the firm's proportion of total youth labor demand are uncorrelated. Then, $E(\beta_j) = \bar{\sigma}_j$. Second, assume that firms in the region adjust to relative output elasticities by varying only N_1 and hold the employment of other labor classes constant. In such a case, σ^*_{jk} and the firm's proportion of total youth labor demand are negatively correlated. Then, $E(\beta_j) < \bar{\sigma}_j$.

These cases are obviously extremes. Since firms are free to vary all their labor inputs, the truth lies somewhere between the two extremes. However, it should be remembered that no matter if one is considering the mean ratios or the mean ratios plus the weighted deviations, the larger the output elasticity of the alternative labor input relative to the output elasticity of youth labor, the larger will be the response of proportionate demand to changes in relative wages.

3.3 Output Elasticity and the Elasticity of Substitution: A Review of Recent Evidence

An exact specification of the homogeneous classes of labor has been postponed until now. One of these classes, youth, has been predefined by the very nature of this study. In order to maintain some degree of homogeneity within classes, the remaining classes will be formed along educational lines.

In anticipation of an empirical analysis of the meta proportionate demand function, it may prove useful to review the recent evidence concerning output elasticities and the elasticity of substitution among labor classes. Unfortunately, none of the studies the evidence is drawn from has examined proportionate demand. However, a review of the evidence may give some indication of what proportionate demand responses may be to changes in wage rates and other variables.

3.3.1 Output elasticities

Two studies by Katz and one by Fisher provide output elasticities for youth. These were reported earlier in Chapter Two and will not be repeated here.[7] All three studies reported negative output elasticities for the vast majority of youth groups considered. This implies either a negative marginal product or a negative average product. In either case, the results are very discouraging and will not be pursued.

The only study that I am aware of that has provided estimates of output elasticities for classes of labor defined along educational lines is one by Psacharopoulos.[8] The

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[7]The interested reader may refer to Table 2-2 for the estimated output elasticities and list of sources.

[8]George Psacharopouos, Returns to Education: An International Comparison (San Francisco: Jossey-Bass Inc., Publishers, 1973), pp. 103-106.

production function was specified in the form,

$$Q = a\, L_p^{\alpha_p}\, L_s^{\alpha_s}\, L_h^{\alpha_h}\, K^k \qquad (3\text{-}28)$$

where,

Q is Gross Domestic Product

L_p is the number of workers with a primary education or less

L_s is the number of workers with a secondary education

L_h is the number of workers with a higher education

K is an index of the capital stock

The output elasticities of the production function were estimated using ordinary least squares, with the production function specified in its log linear form with countries as observations. It was found that $\alpha_p = .14$, $\alpha_s = .36$ and $\alpha_h = .03$. In general, these results cannot be applied directly to the United States since the elasticities were estimated using a data base which included countries at various levels of development. However, if the output elasticity of youth lies somewhere between α_p and α_s, relative elasticities will decrease, increase, and then decrease as one moves up the educational ladder. That is to say, the relationship between education and relative output elasticities has an inverted U shape.

3.3.2 Elasticity of substitution

The linear homogeneous production function of equation (3-1) is a member of a family of constant elasticity of substitution (CES) production function.[9] One of the primary reasons it was selected as the starting point for the development of the meta proportionate demand function is its relative simplicity in mathematical manipulations. However, in its use, as in the use of any tool, there is a trade-off between simplicity and analytical exposition. Embodied in the production function is the implicit assumption that the elasticity of substitution between any two inputs is constant and equal to one. This is largely why the elasticity of substitution has not been discussed. It was always known to be one, no matter which two inputs were compared. However, recent empirical evidence indicates that the elasticity of substitution may be different from one and it may be different for different input comparisons.

Three studies, that I know of, have attempted to estimate the elasticity of substitution between classes of labor defined along educational lines. They include studies

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[9] For the proof, see Henderson and Quandt, Microeconomic Theory: A Mathematical Approach, pp. 85-88.

by Bowles, Psacharopoulos and Hinchliffe and Dougherty.[10] In general, all of the studies assume a production function of the form,

$$Q = F(K, f(N_1, N_2, \ldots, N_m)) \tag{3-29}$$

and seek to identify the parameters of the aggregated labor functions,

$$N^* = f(N_1, N_2, \ldots, N_m) \tag{3-30}$$

The aggregated function for labor is assumed to be a CES function, which may or may not be of the form of equation (3-1). The arguments of the function could be the individual classes of labor or CES functions of the categories. All of the studies, however, assumed a two tier aggregation function. Hence, the elasticities of substitution between the classes of labor may differ.[11]

The elasticity of substitution is a static concept referring to only two factors of production. In the estimating procedure it involves a pairwise comparison between

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[10] Samuel Bowles, "Aggregation of Labor Inputs in the Economics of Growth and Planning: Experiments with a Two-Level CES Function," Journal of Political Economy 78 (January and February 1970): 68-81; George Psacharopoulos and Keith Hinchlifee, "Further Evidence on the Elasticity of Substitution Among Different Types of Educated Labor," Journal of Political Economy 80 (July and August 1972): 786-792; C. R. Dougherty, "Estimates of Labor Aggregation Functions," Journal of Political Economy 80 (November and December 1972): 1101-1119.

[11] See K. Sato, "A Two-Level Constant-Elasticity-of-Substitution Production Function," Review of Economic Studies 34 (April 1967): 201-218.

inputs. Assuming that relative wages are equal to relative marginal products, the elasticity of substitution between N_i and N_j can be written as,[12]

$$\Pi_{ij} = - \partial \log (N_i / N_j) \Big/ \partial \log (W_i / W_j) \qquad (3\text{-}31)$$

where i now refers to the ith input. The elasticity of substitution is a pure number that measures the rate at which substitution takes place. In terms of equation (3-29), it is constant for pairwise comparisons, but may differ between pairwise comparisons.

All of the studies attempt to estimate an equation of the form,

$$\log (W_i / W_j) = a + b_{ij} \log (N_i / N_j) + u_{ij} \qquad (3\text{-}32)$$

The elasticity of substitution is then,

$$\Pi_{ij} \approx 1 / - b_{ij} \qquad (3\text{-}33)$$

The elasticities of substitution estimated by Bowles, and Psacharopoulos and Hinchcliffe are reported

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[12] R. G. Allen, Mathematical Analysis for Economists, (London: Macmillan and Company, 1938), pp. 138-40.

in Table 3-1. The results of the two studies tend to be very different. Psacharopoulos and Hinchlifee found that the labor classes with the highest and lowest levels of education tend to have a relatively low rate of substitution. However, Bowles found that the rate was very large, not significantly different from infinity.

The elasticities of substitution were estimated using international cross-sectional data in the Bowles, and Psacharopoulos and Hinchliffe studies. Since the observations were on countries at various levels of development, the results cannot be applied directly to the United States. However, it is interesting to note that if youth can be considered to be members of the middle educational class, the Bowles study would indicate a very high rate of substitution between youth and the highest class, while the Psacharopoulos and Hinchliffe study would indicate a very low rate.

Dougherty used employment and wage data for states from the 1960 U.S. Census of Population to estimate pairwise elasticities of substitution between eight classes of labor defined along educational lines. His estimates of pairwise elasticities of substitution for the eight basic educational categories appear in Table 3-2. The elasticities between the four educational categories with

Table 3-1

Pairwise Elasticities of Substitution for Three Basic Education Categories: Bowles, 1970, and Psacharopoulos and Hinchliffe, 1972

Years of School Completed	Years of School Completed	
	8-11	12-++
Psacharopoulos and Hinchliffe		
0-7	4.8	.....
8-11		2.2
Bowles		
0-7	12.0	6.4
8-11		202.0*

*Not significantly different from infinity at five percent level.

SOURCES: George Psacharopoulos and Keith Hinchliffe, "Further Evidence on the Elasticity of Substitution Among Different Types of Educated Labor," Journal of Political Economy 80 (July and August 1972): 787; and Samuel Bowles, "Aggregation of Labor Inputs in the Economics of Growth and Planning: Experiments with a Two-level CES Function," Journal of Political Economy 78 (January and February 1970): 73.

Table 3-2

Pairwise Elasticities of Substitution for Eight Basic Educational Categories: Dougherty, 1972

Years of School Completed	Years of School Completed: 1-4	5-7	8	9-11	12	13-15	16-++
0	49.5*	10.9	10.4	7.4	7.0	5.9	5.1
1-4		9.0	17.0	9.0	7.9	6.5	6.0
5-7			52.5	13.9	9.9	6.9	5.4
8				18.1	215.1*	-26.9*	-25.5*
9-11					7.7	6.9	10.1*
12						46.3*	- 8.2
13-15							-17.7*

*Not significantly different from infinity at five percent level.

SOURCE: C. R. S. Dougherty, "Estimates of Labor Aggregation Functions," Journal of Political Economy 80 (November and December 1972): 1112, Table 3.

the highest levels of education are all large. Likewise, the four categories with the lowest levels of education all have high pairwise elasticities.

Using Dougherty's estimates, some guesses can be made about the elasticity of substitution between youth and other classes of workers. Most youth would probably fall into the 9-11 or 12 years of education classes, but because they lack much of the experience of other class members, it may be appropriate to consider them more like the members of the class with 9-11 years of education. Considered in this manner, Dougherty's estimates would suggest that the elasticity of substitution between youth and the lower four classes is greater than between youth and the upper three classes.

3.4 Other Factors Affecting the Demand for Youth Labor

The two sector meta proportionate demand function, as given in equation (3-21), expresses proportionate demand as a function of relative wages and the distribution of youth labor demanded between the two sectors. However, other factors, including the type of jobs performed in the region and cyclical variations in demand in the region, may also have an impact on proportionate demand.

3.4.1 The peripheral job structure

It has been recognized for some time that youth are disproportionately concentrated in a small number of low skill jobs that are primarily of a part-time nature. Appendix A provides a thorough description of "youth favorable" occupations. It is enough to note here that youth favorable occupations tend to require lower levels of skill and provide lower levels of remuneration than other occupations found in the labor market. However, the most dominating characteristic of "youth favorable" occupations is their part-time nature.

Peripherality appears to be the primary characteristic of a "youth favorable" occupation. Most youth are not committed full-time to the market sector. Instead, they divide their time between school and the market sector. The variable work schedules and the freedom of entry and exit from employment are characteristics of peripheral jobs that permit many youth to participate in the world of work who might not otherwise be able to find employment.

An attempt has been made to provide a consistent and precise means of identifying peripheral occupations. Using principal component analysis with special reference to factor analysis and factor rotation techniques, the principal dimensions of occupational labor market segmentation were identified. A complete description of the methodology and data base used and the results obtained from the analysis are provided in Appendix A. Of primary interest for our purposes is the identification of a "peripheral worker" segment of the labor market. Occupations found in the "peripheral worker" segment can be characterized as being of a predominately part-time nature with very low levels of remuneration. Some of the principal occupations found in the segment include, library attendants, teacher aides, waiters and ushers.

Intuitively, one would expect that if youth are primarily peripheral workers, economic regions that have a high percentage of peripheral jobs should also have a large percentage of their total demand directed toward youth. What is needed, then, is some measure of the peripheral job structure of regions.

Regional indexes that account for the relative abundance of peripheral jobs as well as their degree of peripherality can be derived from the "factor score vector" of the "peripheral worker dimension" as developed in Appendix A. By multiplying the number of workers in each occupation in the region by the occupation's factor score on the "peripheral worker dimension" and dividing the sum of the products by the total number of workers in the region gives an index of the peripherality of the region's job structure.

The index of the peripherality of a region's job structure can be stated formally as,

$$S = \sum_{i=1}^{o} s_i E_i \Bigg/ \sum_{i=1}^{o} E_i \qquad (3\text{-}34)$$

where,

s_i is the factor score of the ith occupation of the "peripheral worker" dimension as developed in Appendix A

E_i is the number of workers in the region who are employed in the ith occupation

S is the region's index of the peripheral job structure

When estimating the meta proportionate demand function, S can now be included in the model to account for differences in the peripheral job structure between regions.

3.4.2 The skill structure of employment

It is to be expected that the level of skill associated with the production activities of a given region will affect the proportion of total demand that is directed toward youth. Given that youth form a relatively unskilled group of cohorts and other worker groups form relatively more skilled cohort groups, an increase in the level of skill associated with the production process will cause a decrease in the proportion of total demand that is directed toward youth. That is to say, relative output elasticities are dependent on the region's skill structure of employment.

One possible measure of a given region's skill structure of employment is the median number of years of education that is characteristic of the jobs performed in the region. In such a case, it may be preferable to refer to an educational structure rather than a skill structure. By multiplying the number of workers in each occupation in the region by the occupation's median years of education and dividing the sum of the products by the region's total employment gives an index of the region's educational structure of employment.[13]

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[13]The mean number of years of formal education of occupational members or the distribution of years of formal education among occupational members are actually rather mediocre measures of the level of skill associated with a given occupation. Formal education is but one means occupational members have of acquiring training. Besides formal education, workers can increase their level of skill through vocational training programs and on-the-job training. However, years of formal education is the only readily available and reliable measure of skill associated with the 1970 census classifications.

The index of a region's educational structure of employment can be formally stated as,

$$Y = \sum_{i=1}^{o} y_i E_i \Bigg/ \sum_{i=1}^{o} E_i \tag{3-35}$$

where,

y_i is the median years of education of workers in the ith occupation

E_i is the number of workers in the region who are employed in the ith occupation

Y is the index of a region's educational structure of jobs.

When estimating the meta proportionate demand function, Y can now be included in the model to account for differences in the educational structure of employment between regions.

3.4.3 Relative skill differences

In the development of the firm's proportionate demand function, it was assumed that there were m homogeneous classes of labor. This assumption was retained when the firm's proportionate demand function was extended to a meta proportionate demand function. Such an assumption is quite valid for a purely theoretical discussion. However, it should be realized that no matter how the classes of labor are defined, in reality no purely homogeneous groups can be formed.[14] What is more important for empirical validation of the theory, is the fact that the class characteristics will not remain constant across regions. Thus, in anticipation of a possible empirical analysis of the theory, it is worth considering the case where the characteristics of the classes will vary across regions because of the inability of the investigator to construct perfectly homogeneous groups.

If it is accepted that class characteristics will vary between regions, variables must be added to the model to take account of such variation. In terms of the proportionate demand function, the most important possible difference in labor classes between regions is obviously skill differences.[15] Letting mean years of education serve as an indicator of the level of skill of a labor class, a set of $m - 1$ variables can be specified to account for variations in skill levels of labor classes across regions. Let R be a $1 \times m$ row vector and define the jth element as,

$$r_j / r_1 \qquad (3\text{-}36)$$

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[14]This ignores the rather trivial case where each group contains only one member.

[15]As in previous cases, because of the lack of data on skill levels, years of formal education must serve as an indicator of the level of skill associated with any labor class.

where,

r_j is the mean number of years of education of the jth class of labor

It can be expected that, holding other things constant, as r_j / r_1 increases, the proportion of total labor demand directed toward youth will decrease. That is to say, relative output elasticities are dependent on skill differences between classes of labor.

When estimating the meta proportionate demand function, the set of m - 1 measures of relative skill can now be included in the model to account for differences in the relative skill of the labor classes between regions.

3.4.4 Cyclical variation in demand

Recruiting, hiring and training costs constitute an investment by the firm in its labor force. Earlier theoretical works by Walter Oi, Gary Becker and Jacob Mincer suggest that a firm faced by a cyclical decline in product demand could protect this investment by following a discriminatory layoff policy.[16] By laying off the workers

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[16]For a complete analysis of the development of the theory, see Jacob Mincer, "On-the-Job Training: Costs, Returns and Some Implications," Journal of Political Economy, Supplement 70 (October 1962): 50-73; Gary Becker, "Investment in Human Capital: A Theoretical Analysis," Journal of Political Economy, Supplement 70 (October 1962):

with the shortest expected periods of employment, the average employment of the workers who remain employed can be lengthened. Such a discriminatory layoff policy tends to reduce the voluntary quit rate faced by the firm, lowering recruiting, hiring and training costs. Such a result is achieved by minimizing the number of new hires required to replace old workers who may voluntarily quit in future periods.

Past studies strongly indicate that youth form a highly mobile group of cohorts. They remain attached to a given job only for a short period of time and they change jobs often during a given period of time.

Some recent evidence on job tenure has been offered by Edward O'Boyle.[17] As can be observed in Table 3-3, he found an increasing relationship between age and job tenure for both males and females up to age 65. Job tenure was six months or less for males and females 16-19 years old, indicating a substantially large amount of inter-job movement. However, as one moves up the age ladder, job tenure increases. For example, median years on current

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9-49; Gary Becker, Human Capital, National Bureau of Economic Research (New York, 1964); Walter Oi, "Labor as a Quasi-Fixed Factor," Journal of Political Economy 70 (December, 1962): 538-555.

[17]Edward O'Boyle, "Job Tenure," Monthly Labor Review 92 (September 1969): 16-23.

Table 3-3

Median Years on Current Job, January 1968

Age	All Workers		Male		Female	
	Male	Female	White	Nonwhite	White	Nonwhite
16-17	.5	.5	.5	.4	.5	....
18-19	.5	.5	.5	.4	.5	.4
20-24	.8	.9	.8	.7	.9	.8
25-29	2.1	1.4	2.2	1.9	1.4	1.3
30-34	3.9	1.8	4.0	3.1	1.8	1.8
35-39	5.8	2.6	6.0	4.1	2.4	3.2
40-44	8.4	3.2	8.7	5.8	3.2	3.4
45-49	10.2	4.4	10.4	8.8	4.4	4.1
50-54	12.6	6.2	12.8	10.1	6.1	6.8
55-59	14.7	8.2	14.9	11.9	8.3	7.4
60-64	15.1	9.4	15.5	11.7	9.6	8.6
65-69	12.4	10.5	12.6	11.1	10.5	....
70-++	16.0	9.1	16.3	....	8.7	....

SOURCE: Edward O'Boyle, "Job Tenure," Monthly Labor Review 92 (September 1969): 18, Table 1.

job is over twenty times as large for 45-49 year old males as it is for 16-19 year old males.

It is interesting to note that job tenure varies little between sex-color groups for youth. It appears, however, that nonwhite youth have slightly lower median years of job tenure than white youth. Median months on current job is 6 for white youth and only 4.8 for nonwhite youth.

Information on job tenure for youth is a poor guide to the mobility of youth. If youth were relatively immobile, the increasing relationship between age and job tenure, revealed by Table 3-3, would still be apparent.

A study by Samuel Saben of the occupational mobility of employed workers provides evidence on the mobility of youth.[18] As can be observed in Table 3-4, Saben found a decreasing relationship between age and job tenure for all sex-color groups. Occupational mobility rates were between 32 and 28 for 18-19 year olds, indicating a substantial amount of inter-occupational mobility. However, as one moves up the age ladder, mobility rates decline. For example, the mobility rate for 18-19 year old males is over six times as large as it is for 45-54 year old males.

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[18] Samuel Saben, "Occuptional Mobility of Employed Workers," Monthly Labor Review 90 (June 1967): 31-38.

Table 3-4

Occupational Mobility Rates Between
January 1965 and January 1966[a]

Age	All Workers		Male		Female	
	Male	Female	White	Nonwhite	White	Nonwhite
18-19	31.7	20.9	31.8	....	28.3	....
20-24	28.5	14.9	28.4	29.2	14.4	19.0
25-34	13.8	8.5	13.5	16.8	8.3	9.7
35-44	7.4	5.3	7.2	9.5	5.5	4.3
45-54	5.2	4.7	5.1	6.6	4.8	3.8
55-64	3.8	2.4	3.8	3.7	2.6	1.2
65-++	2.7	1.8	2.7	3.5	1.6	....

[a]Saben defines the occupational mobility rate as the proportion of persons employed in both January 1965 and January 1966, who had a different occupation in January 1966 than they did in January 1965.

SOURCE: Samuel Saben, "Occupational Mobility of Employed Workers," Monthly Labor Review 90 (June 1967): 34, Table 2.

Likewise, the mobility rate for 18-19 year old females is over six times as large as it is for 45-54 year old females.

The evidence from the O'Boyle and Saben studies strongly supports the concept that youth form a highly mobile group of cohorts. They remain attached to a given job only for a short period of time and they change occupations often. Thus, given nonwage costs of employment, it can be expected that youth will be disproportionately affected by cyclical variations in demand. In terms of the proportionate demand function, it can be expected that the proportion of total demand directed toward youth will vary directly with cyclical variations in demand.

When estimating the meta proportionate demand function, some measure of cyclical variation in demand must be included in the model to account for differences in the cyclical variation in demand between regions. It is not obvious what this measure may be. Intuitively, one would expect the unemployment rate to be an excellent measure of the cyclical variation in demand. However, Mincer has suggested that regional differences in unemployment rates represent long-run structural differences between regions rather than cyclical differences. For this reason, the rate of growth of employment in the region appears to be a preferable measure of cyclical variations in demand.[19]

3.5 Summary

This chapter has been concerned exclusively with the demand for youth labor. Starting with cost minimization for a single competitive firm faced with a linearly homogeneous production function of the Cobb-Douglas variety, a two-sector meta proportionate demand function for youth was derived. It was shown that the proportion of total labor demand directed toward youth is a function of relative wages, relative output elasticities and the proportion of youth demanded in the regulated and unregulated sectors of the regional labor market.

Available evidence on expected relative output elasticities and elasticities of substitution was reviewed. Unfortunately, reliable evidence on the output elasticity of youth and on the elasticity of substitution between youth and other classes of labor was found to be nonexistent. However, it was shown that if youth could be assigned the attributes of workers with more than a grade school education

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[19] Jacob Mincer, "Labor Force Participation and Unemployment: A Review of Recent Evidence," in Prosperity and Unemployment, ed. Robert Gordon and Margaret Gordon (New York: John Wiley and Sons, Inc., 1966), p. 80.

but with less than a high school certificate, they were relatively more substitutable for classes of labor with low educational attainment than classes of labor with high educational attainment.

Factors other than those embodied in the two-sector meta proportionate demand function that may have an effect on the proportion of total demand directed toward youth were also discussed. The peripheral job structure, the educational structure of employment and the relative difference in skill levels between labor classes were shown to have possible impact on the proportion of total demand directed toward youth. Also, given that nonwage costs of employment are not minimal, cyclical variations in demand will have an impact on the proportion of total demand directed toward youth.

Chapter 4

EMPIRICAL EVIDENCE: THE DEMAND FOR YOUTH LABOR

The meta proportionate demand function introduced in Chapter Three provides the basic form for the demand equations to be empirically examined in this chapter. The meta proportionate demand equation is conceptually different from the more traditional demand equations. It is not concerned with the volume of youth labor demanded, but with the proportion of total demand directed toward youth.

The first section of the present chapter introduces the data base which was used in estimating the coefficients of the proportionate demand functions. This is followed by a discussion of the independent variables which were compiled from the raw data base. One of the most serious problems encountered in the empirical estimation of the proportionate demand functions was multicollinearity of a very high degree. The third section discusses this problem and introduces the methodology that was employed in seeking a partial solution. The results of the empirical investigation which involved four separate proportionate demand functions are discussed in the fourth section. It will be remembered that one of the assumptions underlying the meta proportionate demand function of Chapter Three was a constant elasticity of substitution equal to one. The possibility of the elasticity of substitution between labor inputs being different from one is explored in the fifth section.

4.1 The Data Base

The one in one hundred county group public use sample of basic records from the 1970 census served as the primary data source for the empirical investigation. The 1970 public use sample is a representative sample of the records from the 1970 census sample questionnaires. The primary sample size is one in a hundred, or one sample household for every one hundred households in the population. For each household, information is provided about the housing unit itself, as well as the characteristics of the household members. Thus, the data base is very rich in information.

All of the information needed for an estimation of the demand models was computed directly from the public use samples. All of the variables were computed as regional averages and the analysis was conducted on the basis of a cross-sectional approach. The basic cross-sectional unit identified on each household record is economic area, as designated by the Bureau of Economic Analysis, Regional Economics Division. The areas are based on a nodal-functional area concept. That is, to each urban center are attached those surrounding county units where economic activity is focused directly or indirectly on that center. These areas represent an extension of the SMSA concept. SMSA's are normally at the center of these areas. In rural parts of the country, the economic centers are cities of 20,000 to 50,000 in population.[1]

Identified on the records are 149 areas and 408 subareas. Unfortunately, there is a great deal of variation in population between areas and subareas. Many of the areas and most of the subareas have a sample population below 3000. When labor class averages are computed for areas with this small a sample population, the averages have huge standard errors. For this reason, the subareas were aggregated along economic lines to form 71 groups of related subareas. These aggregated groups form the basic cross-sectional unit for investigation. The method of aggregation is fully described in Appendix B.

4.2 The Definition of Variable

Indexes of the educational structure of employment and the peripheral job structure, and the rate of growth of employment were computed for each of the 71 aggregated

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[1]For a complete description of the basic records, see U.S. Bureau of the Census, Public Use Samples of Basic Records from the 1970 Census: Description and Technical Documentation (Washington: U.S. Government Printing Office, 1972).

county groups. The first two measures were defined in Chapter Three and need no further discussion. The rate of growth of employment is defined as,

$$G = (E_{70} - E_{65}) \Big/ E_{70} \qquad (4\text{-}1)$$

where,

E_{70} is the number of workers employed in 1970

E_{65} is the number of workers employed in 1965

G is the rate of growth of employment

G is capable of providing only a rough estimate of the rate of growth of employment in an aggregated county group. Individuals are identified on the records as to their labor force classification in 1965 and 1970, but not as to their place of employment in 1965. Thus, there is no way of knowing if a worker was employed in the same county group at both points in time.

The remaining variables were estimated for the various classes of labor. In Chapter Three, it was hinted that perhaps the best method for forming homogeneous classes of labor is along educational lines. For the purposes of this study, five of the classes of labor are defined as those individuals who have completed 1-8, 9-11, 12, 13-15 and 16-++ years of formal education.

The remaining labor classes form two dichotomous classification systems of males and females and whites and nonwhites for both 16-17 and 18-19 year olds. Information is also provided for 16-17 year olds and 18-19 year olds, sex and color inclusive. It should be obvious that the youth classes are not mutually exclusive. Because of the sparsity of data on nonwhites, it was felt that the formation of purely sex-color exclusive groups would be ill-advised.

Mean years of formal education, number of workers employed and mean wage rates were computed for each of the fifteen classes. The latter two variables were also computed by coverage status for the classes of labor. All three of the measures were computed only for those class members who were employed members of the noninstitutionalized civilian labor force.

Mean years of education and the number of workers employed for each of the labor classes can be computed directly from the public use records. However, no information is provided about wage rates, and they must be estimated. The estimated mean wage rate for the jth class of labor is defined as,

$$W_j = \sum_{i=1}^{n} (E_i \,/\, H_i X_i) \Big/ n \qquad (4\text{-}2)$$

where,

W_j is the mean wage rate for the jth class of worker

E_i is yearly wage and salary earnings for the ith member for 1969

H_i is the number of hours worked by the ith member in the week prior to enumeration

X_i is the number of weeks worked by the ith member in 1969

The problems associated with this estimator are obvious. However, very acceptable mean wage rates were obtained for each of the five educational labor classes. The wage rates obtained for youth appear to be biased upward. This can be attributed to two factors. One, youth appear to overstate their earnings more than others. Two, youth tend to be highly mobile in terms of their in and out of the labor force movement. Thus, for the typical school attender, earnings in 1969 include earnings from part-time employment during the school year and full-time employment during the summer. Since the census was taken during the school year, the hours worked reported corresponds to hours of part-time employment. This provides an upward bias to estimated mean wages for youth enrolled in school.

Wage rates and level of employment were determined for each class of worker by coverage status under the minimum wage provisions of the Fair Labor Standards Act. This required precise and consistent definitions of "covered" employment and "uncovered" employment. The decision rule, which was used in determining the coverage status of workers, is given in Appendix C. On the basis of their earnings, level of education, industry, occupation and "class" (that is, if they are a federal government employee, self-employed, and so forth), individuals were classified as being covered or uncovered by the minimum wage provisions of the Fair Labor Standards Act.

4.3 Multicollinearity

One of the greatest problems encountered in the empirical estimation of the demand functions for youth labor was multicollinearity of a very high degree. A high degree of multicollinearity is harmful in the sense that the estimates of the regression coefficients are highly imprecise. The imprecision arises because of the relative large variances of the least squares estimators.[2]

Table 4-1 presents the correlation matrix for the wage ratios and education ratios for 18-19 year olds for both sectors that were suggested for inclusion in the proportionate demand function. To simplify notation, $\bar{W}_j$ refers to the ratio of the wage rate of the jth form of labor to the wage rate for 18-19 year olds. So as not to be confused with a partial correlation coefficient, $\bar{E}_j$ now refers to

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[2] See Henri Theil, Principles of Econometrics (New York: John Wiley and Sons, Inc., 1971), pp. 147-154.

Table 4-1

Correlation Matrix for Wage Ratios and Education Ratios, Both Sectors: 18-19 Year Olds[a]

	$\bar{W}_{1-8}$	$\bar{W}_{9-11}$	$\bar{W}_{12}$	$\bar{W}_{13-15}$	$\bar{W}_{16-++}$	$\bar{E}_{1-8}$	$\bar{E}_{9-11}$	$\bar{E}_{12}$	$\bar{E}_{13-15}$	$\bar{E}_{16-++}$
$\bar{W}_{1-8}$	1.00000									
$\bar{W}_{9-11}$	0.95266	1.00000								
$\bar{W}_{12}$	0.89247	0.93329	1.00000							
$\bar{W}_{13-15}$	0.75738	0.78478	0.88827	1.00000						
$\bar{W}_{16-++}$	0.63527	0.65776	0.71822	0.70373	1.00000					
$\bar{E}_{1-8}$	0.05359	0.08093	0.23271	0.17402	0.25449	1.00000				
$\bar{E}_{9-11}$	0.17155	0.12367	-0.09971	-0.16993	-0.13804	-0.53774	1.00000			
$\bar{E}_{12}$	0.23285	0.20197	-0.01982	-0.11810	-0.07591	-0.44266	0.97883	1.00000		
$\bar{E}_{13-15}$	0.26524	0.23541	0.01145	-0.10969	-0.07403	-0.43864	-0.96524	0.99087	1.00000	
$\bar{E}_{16-++}$	0.24008	0.19569	-0.00347	-0.08504	-0.07013	-0.48746	0.96002	0.97944	0.97238	100000

[a]For an explanation of notation, see text.

the ratio of the level of education for 18-19 year olds to the level of education of the jth labor class. As can be observed from the table, the set of wage ratios and the set of education ratios have strong intraset correlation, but virtually no interset correlation. The high intraset correlation suggests a very hideous form of multicollinearity.

One possible measure of multicollinearity is the determinant of the correlation matrix. In the absence of any correlation between the variables, the determinant will be one. In the presence of perfect multicollinearity, the matrix will be singular and the determinant will be zero. For the matrix given in Table 4-1, the determinant was found to be 3.4×10^{-9}. This suggests that the degree of multicollinearity is very high.

The problem of multicollinearity was found to exist for the sets of wage ratios and education ratios for all the youth groups. For example, the determinant of the correlation matrix for the wage ratios and the education ratios for 16-17 year olds was found to be 2.2×10^{-9}. Obviously, this high degree of multicollinearity would severely detract from any form of estimation.

There exists no general solution to the multicollinearity problem. About the only action that can be taken is to specify the model in some other form or derive principal components for the set of highly interrelated variables.[3] The latter solution was sought in this study.

The ten sets of relative wage variables for each sector and the ten sets of relative levels of education were submitted to principal component analysis. Two principal components were derived for each set of variables. In general, these two components could account for over 90 percent of the variation in the original five variables. The solution was then rotated to simple structure using the Varimax method of rotation.[4]

While not all of the rotated factor matrixes will be presented, Table 4-2 provides an excellent example of their general character. Table 4-2 gives the rotated factor matrix for the wage ratios for 18-19 year olds for both sectors. As can be observed from the table, the first dimension can be interpreted as "low education wage ratios" and the second dimension as "high education wage ratios". All of the factor matrixes follow this same general bifactor pattern.

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[3]See Lawrence Klein and Nakomura Mitsugu, "Singularity in the Equation Systems of Econometrics," International Economic Review 3 (September 1962): 274-299.

[4]For a more complete discussion of principal components, its relationship to factor analysis and rotational techniques, the reader is referred to Appendix A, Section A.2.1.

Table 4-2

Rotated Factor Matrix for the Wage Ratios,
Both Sectors: 18-19 Year Olds

Variable	Factor 1	Factor 2
$\bar{W}_{1-8}$	.915	.317
$\bar{W}_{9-11}$	.916	.353
$\bar{W}_{12}$	.843	.491
$\bar{W}_{13-15}$	.685	.599
$\bar{W}_{16-++}$	.335	.921

Table 4-3

Rotated Factor Matrix for the Education Ratios,
Both Sectors: 18-19 Year Olds

Variable	Factor 1	Factor 2
$\bar{E}_{1-8}$	-.244	.969
$\bar{E}_{9-11}$	.934	.321
$\bar{E}_{12}$	.975	.210
$\bar{E}_{13-15}$	.971	.205
$\bar{E}_{16-++}$	.952	.262

The rotated factor matrix for the education ratios for 18-19 year olds for both sectors can serve as an example of the general character of the ten rotated factor matrixes for the education ratios. As can be observed from Table 4-3, a bifactor solution is achieved. The first dimension can be interpreted as "high education ratios" and the second as "low education ratios". All of the factor matrixes for the education ratios follow this same general bifactor pattern.

4.4 The Proportionate Demand Functions for Youth Labor

Four separate proportionate demand functions for youth labor are presented in this section. All of these functions are derived by aggregating equation (3-12) under alternative assumptions. The first function presented does not attempt to differentiate between the covered sector and the uncovered sector. The next two functions are simply proportionate demand functions for the uncovered sector and the covered sector. They correspond to equations (3-19) and (3-20). The last proportionate demand function is the familiar two-sector meta proportionate demand function of equation (3-21).

Two points should be noted before the proportionate demand functions are presented. First, all of the functions are estimated in their inverse form. That is, they are of the same general form as equation (3-21). The dependent variable is then the ratio of total labor demand to youth labor demand. If the proportionate demand function itself were estimated, one would lose the relatively simple estimating procedures for linear models.

Second, since no data is available on the number of vacancies for youth or for educational classes of labor by aggregated county groups, the dependent variable is the ratio of total employment to youth employment rather than the ratio of total demand to youth demand. This introduces a bias into the measure of proportionate demand. For example, the relationship between inverse proportionate employment and inverse proportionate demand can be stated as,

$$\sum_{j=1}^{m} (X_j + V_j) \Big/ (X_1 + V_1) = a \sum_{j=1}^{m} X_j \Big/ X_1 \tag{4-3}$$

where,

X_j is the number of workers of the jth labor class employed

V_j is the number of vacancies observed for the jth class of labor

a is some constant to be determined

and subscript 1 refers to youth.

It can be shown that a = 1 when

$$\sum_{j=1}^{m} V_j \Big/ V_1 = \sum_{j=1}^{m} X_j \Big/ X_1 \tag{4-4}$$

a > 1 when,

$$\sum_{j=1}^{m} V_j \Big/ V_1 < \sum_{j=1}^{m} X_j \Big/ X_1 \tag{4-5}$$

a < 1 when,

$$\sum_{j=1}^{m} V_j \Big/ V_1 > \sum_{j=1}^{m} X_j \Big/ X_1 \tag{4-6}$$

Hence, when a = 1, inverse proportionate demand is equal to inverse proportionate employment; when a > 1, inverse proportionate demand is greater than inverse proportionate employment; and when a < 1, inverse proportionate demand is less than inverse proportionate employment.

Because of the lack of relevant data, it is impossible to estimate a. However, because of the chronically high unemployment rate for youth over the past decade, it is suspected that a < 1 and the estimates for inverse proportionate demand have a downward bias. Therefore, all the estimated coefficients need to be corrected by the factor 1/a. Unfortunately, without knowing what a is, such a correction is not possible. <u>However, it should not be forgotten that all of the estimated coefficients of the</u>

<u>proportionate demand function have an upward bias and need to be corrected by some multiplicative constant that is greater than zero, but less than one</u>.

4.4.1 The one-sector proportionate demand function

Before considering the two-sector models, it might be interesting and very enlightening to consider a proportionate demand function that does not differentiate between the two sectors. Following the theory developed in Chapter Three, the one-sector proportionate demand function can be specified in its inverse form as,

$$D = a + b_1 \bar{W}_L + b_2 \bar{W}_h + b_3 \bar{E}_h + b_4 \bar{E}_L + b_5 G + b_6 S + b_7 Y + e \qquad (4\text{-}7)$$

A guide to the notation is provided in Table 4-4.

Equation (4-7) was estimated using ordinary least squares. The estimated regression coefficients for males, females, whites, nonwhites and total are provided for 16-17 year olds in Table 4-5.

As can be observed from Table 4-5, the estimated coefficients for $\bar{W}_L$ and $\bar{W}_h$ are negative in all cases where they are significant. This is disappointing and a little disturbing, but by no means a refutation of the underlying theory. It should be remembered from Chapter Three that

Table 4-4

Guide to Notation

Symbol	Definition
D	the ratio of total employment to youth employment in the two sectors
D_c	the ratio of total employment to youth employment in the covered sector
D_v	the ratio of total employment to youth employment in the uncovered sector
$\bar{W}_L$	the lower labor classes' wage ratio dimension for both sectors[a]
$\bar{W}_h$	the upper labor classes' wage ratio dimension for both sectors[a]
$\overline{CW}_L$	the lower labor classes' wage ratio dimension for the covered sector[a]
$\overline{CW}_h$	the upper labor classes' wage ratio dimension for the covered sector[a]
$\overline{VW}_L$	the lower labor classes' wage ratio dimension for the uncovered sector[a]
$\overline{VW}_h$	the upper labor classes' wage ratio dimension for the uncovered sector[a]
$\bar{E}_L$	the lower labor classes' education ratio dimension for both sectors[a]
$\bar{E}_h$	the upper labor classes' education ratio dimension for both sectors[a]
$\overline{CE}_L$	the lower labor classes' education ratio dimension for the covered sector[a]
$\overline{CE}_h$	the upper labor classes' education ratio dimension for the covered sector[a]
$\overline{VE}_L$	the lower labor classes' education ratio dimension for the uncovered sector[a]

Table 4-4
(Continued)

Symbol	Definition
$\overline{VE}_h$	the upper labor classes' education ratio for the uncovered sector[a]
G	the rate of growth of employment
S	the index of the peripheral job structure
Y	the index of the educational structure of employment
P_c	the proportion of youth employed in the covered sector
P_v	the proportion of youth employed in the uncovered sector
e	an error term

[a]Derived from principal component analysis.

Table 4-5

Estimated Coefficients for the One Sector Meta Proportionate Demand Function: 16-17 Year Olds[a]

Independent Variables	Sex-Color Classes				
	Male	Female	White	Nonwhite	Total
Constant	379.20 (1.23)	467.52 (0.98)	512.07 (1.48)	2361.9* (2.15)	121.08 (1.36)
$\bar{W}_L$	- 34.67* (2.22)	- 26.75 (1.68)	- 15.90 (0.98)	- 958.7** (2.80)	- 11.24* (2.27)
$\bar{W}_h$	- 12.11 (0.45)	- 12.47 (0.03)	0.72 (0.00)	-1629.5* (2.08	- 2.90 (0.36)
$\bar{E}_h$	83.79 (0.69)	660.79** (2.71)	44.58 (0.26)	-9619.2** (3.42)	42.42 (1.12)
$\bar{E}_L$	-399.27** (4.58)	-773.22** (6.18)	-437.95** (5.57)	2005.0** (5.11)	-115.80** (5.36)
G	- 3.27** (5.09)	- 2.17* (2.27)	- 2.05** (3.28)	453.99 (1.28)	- .726** (9.23)
S	- 15.06** (3.13)	4.95 (0.72)	- 11.77** (2.68)	207.14 (0.79)	- 3.33** (2.72)
Y	6.73 (0.48)	-41.59* (2.11)	- 5.26 (0.38)	1642.2* (2.26)	- 1.52 (0.40)
R^2	.443	.547	.457	.426	.446

[a]For a description of the notation, see Table 4-4. The absolute value of the ratio of the regression coefficient to its standard error is given in parentheses.

*Significantly different from zero at the five percent level.

**Significantly different from zero at the one percent level.

the coefficients for the wage ratios can be negative if youth are concentrated in firms with output ratios below the mean output ratio for the region as a whole.

The estimated coefficient for $\bar{E}_h$ is positive for females (a white dominated class) and negative for nonwhites. As the level of education of females increases relative to the level of education of the upper labor classes, females are substituted for the upper class of workers. However, the opposite is true for nonwhites. As the level of education of the upper classes of labor increases relative to the education of nonwhites, the proportion of total demand directed toward nonwhite youth increases. Obviously, nonwhite youth are <u>complements</u> to the upper labor classes in terms of <u>quality changes</u>. As the quality of the upper labor classes increases relative to nonwhites, the proportionate demand for nonwhites increases. Hence, one finds nonwhites concentrated in occupations such as hospital orderlies and attendants in physicians' offices which are complements to occupations that require a high level of education.

Conversely, the estimated coefficient for $\bar{E}_L$ is negative for white dominated classes (males, females and whites) and positive for nonwhites. As the level of education of nonwhites increases relative to the level of education of the lower labor classes, nonwhites are substituted for the lower class of workers. However, the opposite is true for whites. As the level of education of the lower class of labor increases relative to the education of whites, the proportion of total demand directed toward white youth increases. Obviously, white youth are complements to the lower labor classes in terms of quality changes. As the quality of the lower labor classes increases relative to whites, the proportionate demand for whites increases. Thus, one finds whites concentrated in occupations such as stock handlers and construction laborers which are complements to occupations that require a low level of education.

G and S have the expected negative signs in all cases where they are significant. The ratio of total demand to youth demand is more sensitive to the rate of growth in the case of males than in the case of females. This is not surprising considering that males are more occupationally mobile than females. Likewise, males are more dependent on the type of jobs offered in the region than females. Female youth appear relatively insensitive to the degree of peripherality of the job structure.

Y has the expected positive impact for nonwhite youth. As the index of the educational structure of employment increases, the proportionate demand for nonwhite youth decreases. Surprisingly, the opposite effect is noted for female youth. As the index of the educational structure of employment increases, the proportionate demand for female youth increases.

The estimated regression coefficients for males, females, whites, nonwhites and total are provided for 18-19 year olds in Table 4-6. As can be observed from the table, the estimated coefficients for $\bar{W}_L$ and $\bar{W}_h$ are not significantly different from zero at any level of acceptable significance. However, $\bar{E}_h$ and $\bar{E}_L$ are significant for all groups of cohorts. As in the case of 16-17 year olds, $\bar{E}_h$ is positive for the white dominated groups and negative for nonwhites. Conversely, $\bar{E}_L$ is negative for the white dominated groups and positive for the nonwhite groups. It appears that 18-19 year old whites are complements to the lower labor classes in terms of quality. Likewise, whites are substitutes for the upper labor classes, in terms of quality changes.

The estimated coefficients for G and S are of the expected negative value for all cases where they are significant at an acceptable level. The proportionate demand for 18-19 year olds is far less sensitive to the rate of growth and the peripheral job structure than the proportionate demand for 16-17 year olds. It was again found that the proportionate demand for males is more sensitive to the rate of growth than is the proportionate demand for females.

The educational structure of employment is significant for all youth groups except nonwhites. The

Table 4-6

Estimated Coefficients for the One Sector Meta Proportionate Demand Function: 18-19 Year Olds[a]

Independent Variables	Sex-Color Classes				
	Male	Female	White	Nonwhites	Total
Constant	-195.03 (1.64)	72.10 (0.54)	-231.56 (1.76)	771.31 (0.96)	-33.62 (1.10)
$\bar{W}_L$	- .02 (0.00)	- 7.69 (1.11)	- 2.44 (0.32)	31.86 (0.11)	- 1.24 (0.75)
$\bar{W}_h$	2.20 (0.24)	- 6.02 (0.62)	0.06 (0.00)	-738.24 (1.12)	- 0.60 (0.25)
$\bar{E}_h$	129.88** (3.09)	233.7** (3.19)	244.95** (4.06)	-9714.0** (3.73)	43.76** (3.57)
$\bar{E}_L$	-128.75** (3.08)	-175.5** (5.59)	-171.64** (4.94)	8882.4* (2.42)	-31.57** (3.86)
G	- 1.23** (5.53)	- 0.92** (4.89)	- .92** (4.58)	7.25 (0.30)	- 0.26** (5.81)
S	31.83 (1.92)	30.15 (1.91)	- 52.44** (3.28)	- 724.81 (0.40)	- 0.77* (2.19)
Y	19.63** (3.97)	-10.07* (2.55)	9.22* (2.07)	- 21.96 (0.04)	2.36* (2.21)
R_2	.464	.644	.533	.267	.527

[a]For a description of the notation, see Table 4-4. The absolute value of the ratio of the regression coefficient to its standard error is given in parentheses.

*Significantly different from zero at the five percent level.

**Significantly different from zero at the one percent level.

proportionate demand for male youth decreases as the level of education associated with the job structure increases. The converse is found for female youth.

In summary, then, the transformed wage ratios were either insignificant or of the wrong sign in all cases. However, this is no refutation of the underlying theory, although it is a disappointment. The transformed educational ratios were significant most of the time. It appears that as the level of education of white youth increases relative to the level of education of the upper labor classes, white youth are substituted for the upper class workers. As the level of education of nonwhite youth increases relative to the level of education of the lower labor classes, nonwhite youth are substituted for the lower class workers. Likewise, it appears that in terms of quality, whites are complements to the lower labor classes, while nonwhites are complements to the upper labor classes. It was also found that the proportionate demand for the various youth groups is sensitive to the rate of growth, the level of education associated with the job structure and the peripherality of the job structure.

4.4.2 Proportionate demand in the covered and uncovered sectors

Before considering the two sector meta proportionate demand function, the proportionate demand functions for the covered and uncovered sectors will be estimated separately. Following the theory developed in Chapter Three, the two functions can be specified as,

$$D_c = a + b_1 \overline{CW}_L + b_2 \overline{CW}_h + b_3 \bar{E}_h + b_4 \bar{E}_L + b_5 G + b_6 S + b_7 Y + e_c \qquad (4\text{-}8)$$

$$D_v = a + c_1 \overline{VW}_L + c_2 \overline{VW}_h + c_3 \bar{E}_h + c_4 \bar{E}_L + c_5 G + c_6 S + c_7 Y + e_v \qquad (4\text{-}9)$$

Since it is expected that the disturbances in the regression equation for the uncovered sector are correlated with the disturbances in the regression equation for the covered sector, equations (4-8) and (4-9) were estimated simultaneously using seemingly unrelated regressions techniques. The estimated regression coefficients for males, females, whites, nonwhites and total for 16-17 year olds are provided in Tables 4-7 and 4-8 for the covered and uncovered sectors, respectively.

As can be observed from Table 4-7, the estimated coefficients for $\overline{CW}_L$ and $\overline{CW}_h$ are positive in all cases except one, where they are significant at a reasonable level. It appears that the ratio of the youth output elasticity to the output elasticities for the upper labor

Table 4-7

Estimated Coefficients for the Covered Sector Meta Proportionate Demand Function: 16-17 Year Olds[a]

Independent Variables	Sex-Color Groups				
	Male	Female	White	Nonwhite	Total
Constant	942.74	-202.45	647.25	-12349.8	243.06
	(1.59)	(0.14)	(1.09)	(1.26)	(1.26)
$\bar{W}_L$	- 35.42*	4.07	- 7.00	47.99*	- 8.27
	(2.50)	(1.46)	(0.51)	(2.04)	(1.35)
$\bar{W}_h$	52.54*	179.23**	54.35*	73.77	24.13*
	(2.10)	(2.68)	(2.40)	(1.43)	(2.55)
$\bar{E}_h$	-20.45	2079.01**	171.17	1481.62	4.76**
	(0.90)	(2.90)	(0.63)	(0.60)	(5.97)
$\bar{E}_L$	-47.36**	-1114.91**	-604.16**	10383.8**	-13.05*
	(2.79)	(3.00)	(4.61)	(2.99)	(2.61)
G	- 5.36**	- 6.58*	- 3.54**	- 17.35	- 1.26**
	(4.33)	(2.26)	(3.42)	(0.55)	(3.35)
S	8.54	- 28.12	4.90	176.88	- 0.42
	(0.92)	(1.36)	(0.66)	(0.75)	(0.15)
Y	17.33	90.38	- 8.20	648.52	- 1.61
	(0.63)	(1.53)	(0.35)	(0.99)	(0.19)

[a]For a description of the notation, see Table 4-4. The absolute value of the ratio of the regression coefficient to its standard error is given in parentheses.

*Significantly different from zero at the five percent level.

**Significantly different from zero at the one percent level.

Table 4-8

Estimated Coefficients for the Uncovered Sector Meta Proportionate Demand Function: 16-17 Year Olds[a]

Independent Variables	Sex-Color Groups				
	Male	Female	White	Nonwhite	Total
Constant	-412.50	469.41	277.01	- 60.58	35.79
	(0.81)	(0.78)	(0.63)	(0.24)	(0.28)
$\bar{W}_L$	4.23	- 3.77	- 20.31	48.80	0.60
	(0.66)	(0.38)	(1.98)	(1.71)	0.21)
$\bar{W}_h$	- 2.16	2.22	- 18.33	68.87	- 1.43
	(0.16)	(0.09)	(1.19)	(0.93)	(0.30)
$\bar{E}_h$	45.04*	145.8	21.49	586.38	53.66
	(2.34)	(0.48)	(1.06)	(0.93)	(1.05)
$\bar{E}_L$	-55.20**	-736.90**	-594.47**	-426.65	-140.89**
	(3.96)	(5.05)	(6.43)	(0.48)	(4.68)
G	- 4.45**	- 1.68	- 2.46**	6.33	- .84**
	(4.22)	(1.40)	(3.27)	(0.81)	(3.58)
S	-24.10**	- 19.43*	- 15.69**	- 37.66	- 5.24**
	(3.06)	(2.24)	(2.82)	(0.64)	(3.05)
Y	37.62	3.52	6.31	10.77	4.71
	(1.60)	(0.14)	(0.37)	(0.65)	(0.89)

[a]For a description of the notation, see Table 4-4. The absolute value of the ratio of the regression coefficient to its standard error is given in parentheses.

*Significantly different from zero at the five percent level.

**Significantly different from zero at the one percent level.

classes is smaller in the case of males than in the case of females. It can be deduced from this that the output elasticity for male youth is larger than the output elasticity for female youth.

It is encouraging to find that the estimates of the ratios of the labor classes' output elasticities to the youth output elasticity have the correct sign. Evidently, by combining the two sectors in the earlier case, the variance of the relative output elasticities was increased significantly. Those firms whose relative output elasticities were negatively skewed tended to have a greater percentage of youth in them. By separating the two sectors, the variance and skew has been reduced and much more reasonable estimates have been obtained. It appears, then, that relative output elasticities are quite different between the two sectors.

The coefficient for $\bar{E}_L$ was found to be significant for all youth groups. The earlier results were repeated, in that the coefficient is negative for all white dominated groups and positive for nonwhites. Thus, as the level of education of the lower labor classes increases relative to the youth group, proportionate demand for whites increases and the proportionate demand for nonwhites decreases. In terms of quality changes, whites are complements to the lower labor classes and nonwhites are substitutes for the lower educational classes.

Conversely, it was found that the coefficient for $\bar{E}_h$ was positive for females and for all sex-color groups inclusive. Thus, in terms of quality changes, females and 16-17 year olds, in general, are substitutes for the higher labor classes.

The estimated coefficients for S and Y were found to be insignificant for all youth classes. However, the coefficient for the rate of growth was significant for all youth classes, except nonwhites. The results are somewhat different from earlier results in that it appears that females are more sensitive to variations in the rate of growth than males. Because of the size of the standard errors of the coefficients for males and females, one cannot be sure if this is true.

The estimated regression coefficients for the uncovered sector are given in Table 4-8. It is disappointing to find none of the coefficients of $\bar{W}_L$ or $\bar{W}_h$ significant at a reasonable level. However, the estimated coefficient for $\bar{E}_L$ is significant for four of the five youth classes. It appears that as a group, 16-17 year olds are more complementary in terms of quality changes, to the lower labor classes in the uncovered sector than in the covered. Likewise, in terms of quality changes, males are more substitutable for the upper labor classes in the uncovered sector than in the covered sector.

The estimated coefficients for G and S had the expected negative sign. The peripheral structure of employment has a far greater impact on the proportionate demand for youth in the uncovered sector than in the covered. Conversely, the rate of growth has a greater impact on the proportionate demand for youth in the covered sector than in the uncovered. This leads one to expect that the nonwage costs of employment are greater in the covered sector than in the uncovered.

The greater sensitivity of proportionate demand to growth in the covered sector is also compatible with the operation of a structured queue. In the existence of inflexible relative wages, such as induced by a federal minimum wage, employers will prefer to hire the higher labor classes if the labor market is very slack and the supply of upper class labor and youth labor is relatively elastic at the given relative wage. As the pace of economic activity quickens, vacancies, recruitment expenditure, overtime and wages will all increase. Employers will find it increasingly costly to limit their hiring to the upper labor classes. Hiring standards will be gradually relaxed and a greater proportion of demand will be directed toward the lower labor classes and youth.

The estimated regression coefficients for males, females, whites, nonwhites and total for 18-19 year olds are provided in Tables 4-9 and 4-10 for the covered and uncovered sectors, respectively. As can be observed from Table 4-9, the estimated coefficients for $\overline{W}_L$ and $\overline{W}_h$ are not significant at a reasonable level for any of the youth groups in the covered sector.

The estimated regression coefficient for $\bar{E}_L$ is significant for all youth classes. It is again found that, in terms of quality changes, white youth are complements to the lower labor classes and nonwhites are substitutes for the lower labor classes. Conversely, in terms of quality changes, whites are substitutes for the upper labor classes and nonwhites are complements to the upper labor classes.

The rate of growth of employment was found to have a positive impact on the proportionate demand for youth labor. The effect appears to be strongest for male youth. Likewise, for whites, the greater the degree of peripherality of the job structure, the greater the proportion of demand directed toward youth.

The estimated regression coefficient for Y was found to be significant for both males and females. Increases in the level of education attached to the job structure stimulate a decrease in proportionate demand for males. The converse is found to be true for females. Increases in the level of education attached to the job

Table 4-9

Estimated Coefficients for the Covered Sector Meta Proportionate Demand Function: 18-19 Year Olds[a]

Independent Variable	Sex-Color Groups: Male	Female	White	Nonwhite	Total
Constant	-151.42 (0.99)	679.25* (2.44)	-121.71 (0.85)	8197.04 (1.07)	17.30 (0.40)
$\bar{W}_L$	- 4.10 (0.51)	1.81 (0.16)	- 2.28 (0.32)	16.47 (0.51)	- 1.60 (0.70)
$\bar{W}_h$	- 6.63 (0.65)	4.68 (0.23)	13.18 (1.42)	27.54 (0.04)	0.55 (0.18)
$\bar{E}_h$	26.79 (0.50)	-109.52 (0.72)	195.64** (2.99)	-8466.43** (3.37)	10.96 (0.63)
$\bar{E}_L$	-118.37* (2.08)	-138.44* (2.11)	-193.95** (5.13)	11340.3** (3.30)	- 27.99* (2.31)
G	- 1.38** (4.87)	- 0.63 (1.62)	- 0.92** (4.38)	27.76 (1.18)	- 0.78** (3.82)
S	2.61 (1.21)	- 2.01 (0.62)	- 3.48* (2.02)	- 81.35 (0.46)	- 0.06 (0.13)
Y	29.40** (4.70)	- 22.98** (2.80)	8.33 (1.79)	- 345.84 (0.73)	2.14 (1.45)

[a]For a description of the notation, see Table 4-4. The absolute value of the ratio of the regression coefficient to its standard error is given in parentheses.

*Significantly different from zero at the five percent level.

**Significantly different from zero at the one percent level.

Table 4-10

Estimated Coefficients for the Uncovered Sector Meta Proportionate Demand Function: 18-19 Year Olds[a]

Independent Variables	Sex-Color Groups				
	Male	Female	White	Nonwhite	Total
Constant	-660.07 (0.79)	0976.36 (2.61)	-932.98 (3.74)	6299.0 (2.19)	215.63 (1.96)
$\bar{W}_L$	8.93 (0.75)	- 5.99. (0.70)	- 6.81 (1.04)	- 18.09 (0.75)	4.14 (1.74)
$\bar{W}_h$	23.65 (1.21)	- 11.71 (1.27)	- 1.51 (0.24)	- 19.04 (0.30)	- .20 (0.07)
$\bar{E}_h$	391.48 (1.34)	725.22** (3 .76)	569.56** (5.06)	- 1.78 (1.98)	124.37** (2.88)
$\bar{E}_L$	-508.56 (1.91)	-318.48** (3.68)	-237.19** (3.88)	1146.01 (0.92)	- 61.67* (2.29)
G	- 5.69** (3.86)	- 2.85** (5.08)	- 2.06** (5.20)	8.65 (1.00)	- .56** (4.73)
S	19.99 (1.75)	- 12.97** (2.77)	- 13.67** (4.52)	64.07 (0.99)	- 4.02** (3.17)
Y	67.98 (1.97)	34.94** (2.82)	36.95** (4.26)	- 3.99* (2.22)	11.57** (2.89)

[a]For a description of the notation, see Table 4-4. The absolute value of the ratio of the regression coefficient to its standard error is given in parentheses.

*Significantly different from zero at the five percent level.

**Significantly different from zero at the one percent level.

structure stimulate an increase in proportionate demand for female youth.

The estimated regression coefficients for the uncovered sector for 18-19 year olds by youth classes are given in Table 4-10. As can be observed from the table, the estimated coefficients for $\bar{W}_L$ and $\bar{W}_h$ are not significant at a reasonable level for any of the youth groups.

The estimated regression coefficients for $\bar{E}_h$ and $\bar{E}_L$ are significant for females, whites and all sex-color groups inclusive. It is again found that, in terms of quality changes, whites are substitutes for the upper labor classes and complements to the lower labor classes. However, by comparing tables 4-9 and 4-10, it can be observed that, in terms of quality changes, whites are more substitutable and better complements to upper and lower class workers, respectively, in the uncovered sector than in the covered.

For all groups they were found significant for, the estimated coefficients for G and S had the expected negative sign. The proportion of total demand directed toward youth increases as the rate of growth and the degree of peripherality of the job structure increases. Conversely, for females and whites, the proportion of total demand directed toward youth decreases as the level of education attached to the job structure increases.

In summary, for both 18-19 and 16-17 year olds, it was found that in the vast majority of cases, the estimated regression coefficients for $\overline{W}_L$ and $\overline{W}_h$ were not significant at an acceptable level. Part of these can be blamed on the character of the estimators.[5] However, much of the blame should probably rest with the poor estimates for youth wages.

It was found that, in those cases where they were significant, the estimated coefficients for $\bar{E}_h$ and $\bar{E}_L$ were positive and negative, respectively, for whites and negative and positive, respectively, for nonwhites. Thus, in terms of quality changes, whites are substitutes for the upper class workers and complements to the lower class workers. Conversely, nonwhites are substitutes for the lower class workers and complements to the upper class workers.

The rate of growth was found to have a positive impact on the proportion of total demand directed toward youth. However, for both 16-17 year olds and 18-19 year olds, an increase in the rate of growth of employment increases the proportionate demand for youth labor more in the covered sector than in the uncovered sector. This is compatible with the assumption that nonwage costs of employment are higher in the covered sector than in the uncovered sector. However, it is also compatible with the theory of the queue in the presence of inflexible wages, such as the federal minimum.

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[5]For a discussion of the character of the coefficients for $\overline{W}_h$ and $\overline{W}_L$, see Section 3.2.1.

The estimated regression coefficients for S and Y had their expected signs in most cases where they were significant at a reasonable level. It was found that increases in the peripherality of the job structure increased the proportion of total demand directed toward youth. Conversely, increases in the level of education attached to a given job structure decreased the proportion of total demand directed toward youth.

4.4.3 The two sector meta proportionate demand function

From equation (3-21), the two sector meta proportionate demand function can be specified in the form,

$$D = a + b_1 P_u \overline{VW}_L + b_2 P_u \overline{VW}_h + b_3 P_c \overline{CW}_L + b_4 P_c \overline{CW}_h + b_5 \bar{E}_h + b_6 \bar{E}_L + b_7 G + b_8 S + b_9 Y + e \qquad (4\text{-}10)$$

The estimated regression coefficients for whites, nonwhites, males, females and total for 16-17 year olds are reported in Table 4-11. As can be observed from the table, the estimated coefficient for the wage ratio dimension is significant for only two youth classes at a reasonable level. Hence, it is impossible to make comparisons between the relative output elasticities of the covered sector and the relative output elasticities of the uncovered sector.

Table 4-11

Estimated Coefficients for the Two Sector Meta Proportionate Demand Function: 16-17 Year Olds[a]

Independent Variable	Sex-Color Groups				
	Male	Female	White	Nonwhite	Total
Constant	466.78 (0.96)	555.23 (0.65)	393.03 (0.83)	-3265.0 (0.31)	142.12 (1.02)
$P_u\overline{VW}_L$	- 37.08 (1.49)	30.24 (0.93)	- 18.23 (0.68)	285.82 (0.52)	- 1.99 (0.21)
$P_u\overline{VW}_h$	- 40.40 (1.05)	- 71.51 (0.90)	- 36.02 (0.79)	568.69 (0.57)	- 9.28 (0.61)
$P_c\overline{CW}_L$	- 13.77 (0.86)	- 6.68 (0.23)	11.21 (0.72)	427.87 (1.43)	- 2.76 (0.46)
$P_c\overline{CW}_h$	62.80 (1.95)	76.90 (1.13)	72.89* (2.54)	467.10 (0.71)	21.82* (2.08)
$\bar{E}_h$	14.47 (0.07)	1040.3* (2.40)	204.31 (0.95)	-3072.0 (1.17)	39.76 (0.68)
$\bar{E}_L$	-543.30** (3.84)	-927.48** (4.16)	-572.81** (5.39)	9731.5* (2.58)	- 138.82** (3.78)
G_r	- 5.15** (4.98)	- 4.25* (2.45)	- 3.04** (3.68)	25.08 (0.77)	- 1.14** (4.16)
S	13.40 (1.74)	16.38 (1.32)	8.97 (1.53)	10.51 (0.04)	1.76 (0.90)
Y	29.12 (1.29)	- 63.80 (1.81)	1.21 (0.06)	230.53 (0.33)	1.08 (0.18)
R^2	.422	.426	.515	.200	.370

[a]For a description of the notation, see Table 4-4. The absolute value of the ratio of the regression coefficient to its standard error is given in parentheses.

*Significantly different from zero at the five percent level.

**Significantly different from zero at the one percent level.

There are no surprises among the remaining estimated coefficients. Whites are again found to be complements to the lower labor classes and substitutes for the upper labor classes in terms of quality changes. Likewise, it is again observed that the proportionate demand for female youth is less sensitive to variations in the rate of growth than in the proportionate demand for male youth.

The estimated regression coefficients by sex-color groups for 18-19 year olds are provided in Table 4-12. As can be seen from the table, the estimated coefficient for the wage ratio dimension is not significant at an acceptable level for any of the youth groups. Therefore, it is impossible to make comparisons between the relative output elasticities of the covered sector and the relative output elasticities of the uncovered sector.

The estimated coefficients for the remaining variables tend to bear out what has been observed earlier. In terms of quality changes, whites are found to be complements to the lower labor classes and substitutes for the upper labor classes. Conversely, in terms of quality changes, nonwhites are found to be complements to the upper labor classes and substitutes for the lower labor classes. Also, it is again observed that the proportionate demand for youth decreases as the level of education attached to the job structure increases, and increases as the degree of peripherality of the job structure increases.

Table 4-12

Estimated Coefficients for the Two Sector Meta Proportionate Demand Function: 18-19 Year Olds[a]

Independent Variables	Sex-Color Groups				
	Male	Female	White	Nonwhite	Total
Constant	-208.44 (1.42)	140.11 (0.60)	-203.63 (1.40)	3200.3 (0.36)	- 38.93 (0.99)
$P_u\overline{VW}_L$	- 5.34 (0.63)	- 5.22 (0.32)	- 12.16 (1.08)	- 309.72 (0.77)	- 3.46 (1.37)
$P_u\overline{VW}_h$	14.03 (0.81)	- 3.46 (0.19)	- 5.45 (0.39)	- 903.71 (1.01)	5.03 (1.35)
$P_c\overline{CW}_L$	0.42 (0.04)	- 6.90 (0.61)	- 1.56 (0.17)	213.36 (0.58)	- .767 (0.33)
$P_c\overline{CW}_h$	- 9.01 (0.74)	- 15.94 (0.80)	8.24 (0.67)	-339.82 (0.36)	- 2.44 (0.76)
$\bar{E}_h$	82.09 (1.56)	166.70 (1.30)	225.75** (3.28)	-8939.8** (3.13)	37.18* (2.28)
$\bar{E}_L$	-158.78** (3.07)	-164.22** (3.19)	-184.33** (4.94)	1033.8** (2.72)	- 30.38** (3.08)
G_r	- 1.68** (6.01)	- 1.21** (3.56)	- 0.94** (3.86)	8.89 (0.34)	- .32** (5.41)
S	3.99 (1.95)	0.63 (0.24)	- 5.21** (3.01)	88.20 (0.45)	- .63 (1.49)
Y	31.31** (5.24)	- 6.60 (0.95)	10.82* (2.25)	218.29 (0.39)	3.98** (2.97)
R^2	.587	.404	.562	.286	.541

[a]For a description of the notation, see Table 4-4. The absolute value of the ratio of the regression coefficient to its standard error is given in parentheses.

*Significantly different from zero at the five percent level.

**Significantly different from zero at the one percent level.

Because of the characteristics of the estimator for relative output elasticities and/or the poor wage estimates for youth, nothing meaningful can be said about the impact of the minimum wage. For this reason, the two sector meta proportionate demand function will be re-expressed in a manner that separates relative wage variations from variations in the extent of coverage. The two sector meta proportionate demand function can be re-expressed as,

$$D = a + c_1 \overline{VW}_L + c_2 \overline{VW}_h + c_3 \overline{CW}_L + c_4 \overline{CW}_h + c_5 \bar{E}_h + c_6 \bar{E}_L + c_7 G + c_8 S + c_9 Y + c_{10} P_c + e \qquad (4\text{-}11)$$

The estimated regression coefficients by youth classes for 16-17 and 18-19 year olds are reported in Tables 4-13 and 4-14, respectively. As can be observed from the tables, most of the earlier noted relationships are again evident. However, the estimated regression coefficient for P_c is of great interest. It is positive and significant for male youth, 16-17 years of age. As the proportion of male youth, 16-17 years of age, covered by the federal minimum wage provisions of the Fair Labor Standards Act increases, the proportion of total demand directed toward them declines. Males, 16-17 years of age, appear to be adversely affected by the extent of coverage of the minimum wage.

Table 4-13

Estimated Coefficients for the Two Sector Meta Proportionate Demand Function: 16-17 Year Olds[a]

Independent Variables	Sex-Color Classes				
	Male	Female	White	Nonwhite	Total
Constant	442.19 (0.93)	553.54 (0.61)	373.02 (0.79)	-300.35 (0.03)	124.40 (0.88)
$\overline{VW}_h$	- 7.37 (1.10)	7.02 (0.47)	- 9.90 (0.82)	-205.75 (1.82)	- 0.35 (0.10)
$\overline{VW}_L$	- 10.55 (0.80)	- 16.77 (0.49)	- 15.19 (0.85)	-262.52 (0.89)	- 2.87 (0.51)
$\overline{CW}_h$	- 22.41 (1.75)	9.48 (0.51)	6.41 (0.52)	315.80 (1.30)	- 3.28 (0.68)
$\overline{CW}_L$	41.34 (1.90)	63.51 (1.47)	47.51* (2.47)	490.00 (0.94)	15.10* (2.15)
$\bar{E}_h$	- 74.79 (0.39)	1044.8* (2.32)	196.64 (0.91)	-4439.6 (1.71)	36.04 (0.61)
$\bar{E}_L$	-481.8** (3.36)	-929.61** (4.07)	-575.19** (5.26)	8916.8* (2.42)	-134.53** (3.57)
G	- 4.75** (4.60)	- 4.16* (2.36)	- 2.98** (3.59)	28.97 (0.93)	- 1.12** (4.05)
S	- 16.69* (2.20)	- 16.90 (1.34)	8.92 (1.48)	100.12 (0.41)	- 2.22 (1.11)
Y	27.72 (1.25)	- 63.49 (1.76)	0.64 (0.03)	111.98 (0.16)	1.61 (0.27)
P_c	155.73* (2.37)	- 37.79 (0.43)	65.88 (1.32)	914.36 (1.85)	18.13 (1.08)
R^2	.463	.421	.257	.272	.382

[a]For a description of the notation, see Table 4-4. The absolute value of the ratio of the regression coefficient to its standard error is given in parentheses.

*Significantly different from zero at the five percent level.

**Significantly different from zero at the one percent level.

Table 4-14

Estimated Coefficients for the Two Sector Meta Proportionate Demand Function: 18-19 Year Olds[a]

Independent Variables	Sex-Color Classes				
	Male	Female	White	Nonwhite	Total
Constant	-233.11 (1.58)	163.38 (0.71)	-215.68 (1.52)	678.31 (0.07)	- 36.25 (0.94)
$\overline{VW}_h$	.496 (0.21)	- 5.05 (1.08)	- 3.22 (0.83)	- 36.35 (0.49)	- 1.36 (1.58)
$\overline{VW}_L$	3.69 (1.04)	- 9.26 (1.77)	- 2.95 (0.85)	-171.03 (0.90)	0.62 (0.66)
$\overline{CW}_h$	- 3.13 (0.39)	0.64 (0.07)	- 1.54 (0.21)	332.04 (0.92)	- 0.27 (0.13)
$\overline{CW}_L$	- 7.98 (0.80)	- 6.59 (0.43)	6.76 (0.72)	-441.15 (0.57)	- 1.05 (0.41)
$\bar{E}_h$	82.31 (1.46)	193.49 (1.51)	229.23** (3.24)	-8494.5** (2.97)	42.18* (2.50)
$\bar{E}_L$	-154.00** (2.81)	-160.72** (3.18)	-184.84** (4.96)	1137.8* (2.28)	- 33.04** (3.24)
G	- 1.63** (5.44)	- 1.27** (3.68)	- 0.94** (3.79)	9.42 (0.35)	- 0.33** (5.43)
S	4.19 (1.93)	0.84 (0.32)	- 4.90** (2.83)	94.36 (0.48)	- 0.47 (1.06)
Y	32.22** (5.33)	- 9.30 (1.30)	10.55* (2.18)	352.02 (0.65)	3.79** (2.76)
P_c	8.95 (0.29)	- 29.68 (1.25)	16.69 (0.72)	-380.67 (0.46)	- 4.61 (0.77)
R^2	.589	.441	.568	.289	.541

[a]For a description of the notation, see Table 4-4. The absolute value of the ratio of the regression coefficient to its standard error is given in parentheses.

*Significantly different from zero at the five percent level.
**Significantly different from zero at the one percent level.

4.5 The Elasticity of Substitution

The proportionate demand equations estimated in Section 4.4 assumed that the elasticity of substitution between the inputs was constant and equal to one. However, recent empirical evidence indicates that the elasticity of substitution may be different from one and it may be different for different input comparisons.[6] This present section explores the possibility that the elasticity of substitution between youth and the various labor classes is different from one and is different for different class comparisons.

In attempting to estimate the elasticity of substitution between labor classes, a constant elasticity of of substitution (CES) production function is assumed of the form,

$$Q = F(K, f(N_1, N_2, \ldots, N_j, \ldots, N_m)) \qquad (4\text{-}12)$$

where,

Q is physical output

K is the stock of capital

N is the stock of labor services

---

[6] See Section 4.3.2 for a discussion of the more recent evidence on the elasticity of substitution. Most of the preliminary discussion in the present section has already been presented in detail in Section 4.3.2.

One then seeks to identify the parameters of the aggregated labor function of the form,

$$N^* = f(N_1, N_2, \ldots, N_j, \ldots, N_m) \tag{4-13}$$

The aggregated labor function is assumed to be a CES function where the arguments of the function could be individual classes of labor or CES functions of the classes. In general, a two-tiered aggregation function that permits the elasticity of substitution between the classes to differ is assumed.

Assuming that relative wages are equal to relative marginal products, the elasticity of substitution between N_i and N_j can be written as,

$$\Pi_{ij} = -\partial \log (N_i / N_j) \Big/ \partial \log (W_i / W_j) \tag{4-14}$$

To approximate the elasticity of substitution between the labor classes, I use ordinary least squares to estimate the equation,

$$\log (W_i / W_j) = a + b_{ij} \log (N_i / N_j) + e \tag{4-15}$$

The elasticity of substitution can then be approximated as,

$$\Pi_{ij} \approx 1 / -b_{ij} \tag{4-16}$$

The estimated elasticities of substitution between the labor classes and between youth and the labor classes are presented in Tables 4-15 and 4-16, respectively. Where comparisons can be made, the estimated elasticities for the labor classes do not differ significantly from those estimated by Dougherty.[7]

As can be observed from Table 4-16, 16-17 year old females have a much lower rate of substitution for the lower two labor classes than do males. Conversely, 18-19 year old males have a lower rate of substitution for the lower four labor classes than do females. Likewise, 18-19 year old nonwhites have a lower rate of substitution for the lower four labor classes than do whites.

In general, I am fairly confident about the elasticities observed between the 16-17 year old white dominated youth classes and the lower two labor classes. Also, I am fairly confident about the elasticities observed between the 18-19 year old youth classes and the lower four labor classes. However, the infinite elasticities observed between the 16-17 year old youth classes and the upper three labor classes and the infinite elasticities observed between the 18-19 year old labor classes and the upper labor classes appear erroneous.

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[7]See Table 3-2.

Table 4-15

Pairwise Elasticities of Substitution for the Five Basic Labor Classes

Labor Classes	Labor Classes			
	9-11	12	13-15	16-++
1-8	54.04	10.94**	11.21**	65.50
9-11		10.56**	11.32**	-619.77
12			11.55**	- 15.57**
13-15				7.51**

**Significantly different from infinity at the one percent level.

Table 4-16

Pairwise Elasticities of Substitution Between the Youth Classes and the Five Basic Labor Classes

Youth Classes	Labor Classes				
	1-8	9-11	12	13-15	16-++
16-17					
Male	14.20	60.24	- 5.91*	-16.47	-14.37
Female	12.48	13.98	- 6.51	-16.24	-24.98
White	9.02**	9.94*	-40.37	-545.85	-40.68
Nonwhite	-32.95	-34.25	-44.37	-74.40	-51.15
All	10.43*	14.75	- 6.84*	-26.18	-19.65
18-19					
Male	28.87	- 6.51*	- 7.46	17.26	- 8.72**
Female	10.35*	-51.06	-16.30	26.34	- 7.39**
White	13.01*	-38.83	- 6.57	62.34	- 8.28**
Nonwhite	32.29	51.57	29.19	41.44	40.63
All	12.14*	- 9.69	- 5.64*	28.84	- 7.25**

*Significantly different from infinity at the five percent level.
**Significantly different from infinity at the one percent level.

Since the data does not refer to a single production process, but to regional aggregates, the estimated elasticity of substitution is not a real parameter of some technical relationship. Specifically, it will reflect the degree of complementarity and substitutability between each of the two types of labor as well as the excluded inputs. I suspect that the infinite elasticities of substitution observed between the youth classes and the upper labor classes are due to this. Since a high percentage of youth are found in sales and service occupations, one would expect them to be complements to the higher labor classes.

4.6 Summary

This chapter has presented empirical evidence on the proportionate demand for youth labor and the elasticity of substitution between the youth classes and the educationally defined labor classes. The data base for the empirical investigation was compiled from the one in one hundred county group public use sample of basic records from the 1970 census. The basic cross-sectional unit defined on the records, county groups, was found to have too small a sample population to provide reliable estimates for the labor classes in most cases. The county groups were aggregated along economic lines to form 71 aggregated county groups, which formed the basic cross-sectional units for the empirical investigation.

From the basic records, data was compiled for each of the 71 aggregated county groups on the educational structure and the rate of growth of employment. Data was also compiled for each of the 71 aggregated county groups on the mean years of education completed by the members of the various labor classes, and on wage rates and employment by coverage status for each of the labor classes. The data was used to estimate demand functions for youth labor which specified the dependent variable as the ratio of total employment to youth employment and the independent variables as relative wages, relative levels of education, the rate of growth of employment, the peripherality of the job structure and the educational structure of employment.

One of the greatest problems encountered in the empirical estimation of the demand functions for youth labor was multicollinearity of a very high degree. To correct for the problem of multicollinearity, the method of principal component analysis with special reference to factor rotation techniques was applied to the sets of wage ratios and education ratios for each of the youth classes. The dimensions revealed could be interpreted as "low education ratios", "high education ratios", "low education wage ratios" and "high education wage ratios".

Four separate proportionate demand functions for youth labor were estimated. Each of the functions were estimated for males, females, whites, nonwhites and sex-color inclusive for both 16-17 and 18-19 year olds. The estimated coefficients of the demand functions suggested that, in terms of quality changes, whites are substitutes for the upper labor classes and complements to the lower labor classes. Conversely, nonwhites are substitutes for the lower class workers and complements to the upper class workers. However, as a group, 18-19 year olds are better substitutes for the lower labor classes than are 16-17 year olds.

The rate of growth was found to have a positive impact on the proportion of total demand directed toward youth. The proportionate demand for 16-17 year olds appears to be affected to a greater degree by variations in the rate of growth than the proportionate demand for 18-19 year olds. However, for both 16-17 year olds and 18-19 year olds, an increase in the rate of growth of employment increases the proportionate demand for youth more in the covered sector than in the uncovered sector. This finding is compatible with the assumption that nonwage costs of employment are higher in the covered sector than in the uncovered sector. It is also compatible with the theory of the queue in the presence of inflexible wages, such as the federal minimum.

The peripherality of the job structure was found to have a positive impact on the proportion of total demand directed toward youth. The proportionate demand for 16-17 year olds was found to be affected to a greater degree by the number and type of peripheral jobs than the proportionate demand for 18-19 year olds. Conversely, the educational structure of employment was found to have a negative impact on the proportion of total demand directed toward youth. The proportionate demand for 18-19 year olds was found to be affected to a greater degree by the level of education attached to the job structure than the proportionate demand for 16-17 year olds.

The inability of the estimating technique to provide consistent estimates of relative output elasticities was one of the major disappointments of the empirical investigation. The majority of the blame must rest with the poor estimates for youth wages. The lack of estimates of relative output elasticities made it impossible to speculate about the impact of variations in the level of the minimum wage on the proportionate demand for youth. However, it was found that the proportion of total demand directed toward 16-17 year old males decreases with increases in the extent of minimum wage coverage.

The poor wage estimates for youth also tempered the conclusions that were drawn from the estimated elasticities of substitution. Reasonable elasticities of substitution between youth and the lower labor classes were found. However, unacceptable infinite elasticities of substitution between youth and the upper labor classes were found. It was felt that the latter findings were due to the large degree of complementarity between youth and the upper labor classes.

Chapter 5

SUMMARY AND CONCLUSIONS

Despite the recent resurgence of research interest in the labor market experience of youth, evidence on the demand for youth, the labor force participation of youth and youth unemployment is very sparse. The majority of the research has given disproportionate attention to the relationship between minimum wages and youth unemployment. The studies that have specifically examined youth unemployment can provide no consensus on the direction and the strength of the unemployment response to minimum wage changes.

Likewise, the evidence is inconclusive with regard to the demand for youth labor and the labor force participation of youth. The majority of studies which have specifically examined the labor force participation of youth have found wages to be an insignificant determinant of youth labor supply. Studies which have examined the demand for youth have found the expected negative relationship between the youth wage and the volume of youth labor demanded. However, nothing meaningful can be said about output elasticities or the elasticity of substitution between youth and other workers. The only conclusive evidence supports the contention that both the supply and the demand for youth labor are highly sensitive to cyclical variations in demand.

If the relationship between the youth wage rate and the supply of youth labor is insignificant, as some studies suggest, or if the "income effect" swamps the "substitution effect", as other studies suggest, variations in the minimum wage might effect youth unemployment through its impact on the demand for youth labor. This suggests a closer examination of the demand for youth labor. Furthermore, we know a great deal about how individual characteristics effect youth labor supply but our knowledge is completely deficient with regard to youth output elasticities and the elasticity of substitution between youth and other workers.

The theoretical underpinnings of the demand for youth labor function were developed in Chapter Three. Starting with cost minimization for a single competitive firm faced with a linearly homogeneous production function of the Cobb-Douglas variety, proportionate demand functions for the sectors covered and uncovered by the minimum wage were developed. These were aggregated to form a two sector proportionate demand function. It was shown that the proportion of total demand directed toward youth is a function of relative wages, relative output elasticities and the proportion of youth demanded in the regulated and unregulated sectors.

Factors other than those embodied in the proportionate demand function for youth may also have an effect on the proportion of total demand directed toward youth. The peripherality of the job structure, the educational structure of employment and the relative differences in skill levels between labor classes may have possible impacts on the proportion of total demand directed toward youth. Also, given that nonwage costs of employment are not minimal, cyclical variations in demand will have an impact on the proportionate demand for youth.

Four separate proportionate demand functions for youth were estimated. Each of the functions was estimated for males, females, whites, nonwhites and sex-color inclusive for both 16-17 and 18-19 year olds. The estimated coefficients of the demand functions suggested that, in terms of quality changes, whites are substitutes for those workers with higher levels of education (upper class workers) and complements to those workers with lower levels of education (lower class workers). Conversely, nonwhites are substitutes for the lower class workers and complements to the upper class workers. However, as a group, 18-19 year olds are better substitutes for the lower classes than are 16-17 year olds.

The rate of growth was found to have a positive impact on the proportion of total demand directed toward youth. The proportionate demand for 16-17 year olds appears to be affected to a greater degree by variations in the rate of growth than the proportionate demand for 18-19 year olds. However, for both 16-17 and 18-19 year olds, an increase in the rate of growth of employment increases the proportionate demand for youth more in the covered sector than in the uncovered sector. This finding is compatible with the assumption that nonwage costs of employment are higher in the covered sector than in the uncovered sector. It is also compatible with the theory of the queue in the presence of inflexible wages, such as the federal minimum.

The peripherality of the job structure was found to have a positive impact on the proportion of total demand directed toward youth. The proportionate demand for 16-17 year olds was found to be affected to a greater degree by the number and type of peripheral jobs than the proportionate demand for 18-19 year olds. Conversely, the educational structure of employment was found to have a negative impact on the proportion of total demand directed toward youth. The proportionate demand for 18-19 year olds was found to be affected to a greater degree by the level of education attached to the job structure than the proportionate demand for 16-17 year olds.

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In conclusion, I would like to make a few general comments. First, there is no need to belate the absence of a more complete data base. It is fairly obvious that better estimates of youth wages and the distribution of youth employment between the covered and uncovered sector is needed. Second, I hope, somewhat vainly perhaps, that this study represents something of a turning point in the analysis of the youth labor market experience. Past studies of youth unemployment and the demand for youth labor have largely ignored the basic tenets of economic theory. Perhaps by returning to the basic fundamentals of economic theory, more meaningful results can be obtained from future studies.

BIBLIOGRAPHY

Adie, Douglas. "Teen-age Unemployment and Real Federal Minimum Wages." Journal of Political Economy 81 (March / April 1973): 435-441.

Adie, Douglas. "The Lag in Effect of Minimum Wages on Teenage Unemployment." Industrial Relations Research Association. Proceedings of the 24th Annual Meeting, pp. 38-46. Madison: n.p., 1971.

Adie, Douglas and Chapin, Gene. "Teenage Unemployment Effects of Federal Minimum Wages." Industrial Relations Research Association. Proceedings of the 23rd Annual Meeting, pp. 117-127. Madison: n.p., 1970.

Adie, Douglas and Galaway, Lowell. "The Minimum Wage and Teenage Unemployment: A Comment." Western Economic Journal 11 (December 1973): 525-528.

Allen, R. G. Mathematical Analysis for Economists. London: Macmillan and Co., 1938.

Barth, Peter. "The Minimum Wage and Teen-Age Unemployment." Industrial Relations Research Association. Proceedings of the 22nd Annual Meeting. Madison: n.p., 1969. pp. 296-310.

Becker, Gary. Human Capital. National Bureau of Economic Research. New York: n.p., 1964.

Becker, Gary. "Investment in Human Capital: A Theoretical Analysis." Journal of Political Economy, Supplement 70 (October 1962): 9-49.

Becker, Gary. "A Theory of the Allocation of Time." The Economic Journal 75 (September 1965): 493-517.

Bowen, William and Finegan, Aldrich. The Economics of Labor Force Participation. Princeton, N.J.: Princeton University Press, 1969.

Bowen, William and Finegan, T. A. "Labor Force Participation and Unemployment." In Employment Policy and the Labor Market, pp. 115-161. Edited by Arthur Ross. Berkeley: University of California Press, 1965.

Bowles, Samuel. "Aggregation of Labor Inputs in the Economics of Growth and Planning: Experiments with a Two-Level CES Function." Journal of Political Economy 78 (January / February 1970): 68-81.

Brozen, Yale. "The Effect of Statuatory Minimum Wage Increases on Teen-Age Employment." Journal of Law and Economics 12 (April 1969): 109-122.

Burns, Arthur. The Management of Prosperity. New York: Columbia University Press, 1966.

Cain, Glen. Married Women in the Labor Force: An Economic Analysis. Chicago: The University of Chicago Press, 1966.

Cain, Glen. "Unemployment and the Labor-Force Participation of Secondary Workers." Industrial and Labor Relations Review 20 (June 1967): 275-297.

Caines, E. J. Some Leading Principals of Political Economy, Newly Expounded. New York: Harper, 1874.

Cooper, S., and Johnston, D. "Labor Force Projections 1970-1980." Monthly Labor Review 88 (February 1965): 129-140.

Dernburg, Thomas and Strand, Kenneth. "Hidden Unemployment 1953-62: A Quantitative Analysis by Age and Sex." The American Economic Review 56 (March 1966): 71-95.

Dernburg, T., and Strand, K. "Hidden Unemployment." Unpublished manuscript. 1965.

Dougherty, C. R. S. "Estimates of Labor Aggregation Functions." Journal of Political Economy 80 (November / December 1972): 1101-1119.

Easley, James and Fearn, Robert. "Minimum Wages and Unemployment of Teenagers." North Carolina State University, 1969. (Mimeographed.)

Fearn, Robert. "Discussion." Industrial Relations Research Association. Proceedings of the 24th Annual Meeting, pp. 139-142. Madison: n.p., 1970.

Fisher, Alan. "The Minimum Wage and Teenage Unemployment: A Comment on the Literature." Western Economic Journal 11 (December 1973): 514-524.

Fisher, Alan. "The Problem of Teenage Unemployment." Ph.D. dissertation, University of California, Berkeley, 1973.

Folk, Hugh. "The Problem of Youth Unemployment." In The Transition from School to Work. A Report Based on the Princeton Manpower Symposium, May 9-10, 1968, pp. 76-106. Princeton: Princeton University, 1968.

Friedman, Milton. A Theory of the Consumption Function. Princeton, N.J.: Princeton University Press, 1957.

Green, P., and Carmone, Frank. Multidimensional Scaling. Boston: Allyn and Bacon, Inc., 1970.

Gruvaeus, Gunnar and Wainer, Howard. "Two Additions to Hierarchical Cluster Analysis." British Journal of Mathematical and Statistical Psychology 25 (September 1972): 200-206.

Harman, Harry. Modern Factor Analysis. Chicago: The University of Chicago Press, 1967.

Henderson, James and Quandt, Richard. Microeconomic Theory: A Mathematical Approach. New York: McGraw-Hill Book Company, 1971.

Jakubauskas, Edward and Palomba, Neil. Manpower Economics. Reading: Addison Wesley Publishing Company, 1973.

Johnson, J. Econometric Methods. New York: McGraw-Hill Book Company, Inc., 1972.

Johnston, Stephen. "Hierarchical Clustering Schemes." Psychometrika 32 (September 1967): 241-254.

Jonassen, Christen and Peres, Sherwood. Interrelationships of Dimensions of Community Systems: A Factor Analysis of Eighty-two Variables. Columbus: Ohio State University Press, 1960.

Kalachek, Edward. "Determinants of Teenage Employment." The Journal of Human Resources 4 (Winter 1969): 1-21.

Kalachek, Edward. The Youth Labor Market. University of Michigan-Wayne State University, Institute of Labor and Industrial Relations, No. 12. n.p.,1969.

Katz, Arnold. "State Minimum Wages and Labor Markets for Youth." University of Pittsburg, 1971. (Mimeographed.)

Katz, Arnold. "Teenage Employment Effects of State Minimum Wages." Journal of Human Resources 8 (Spring 1973): 250-256.

Kerr, Clark. "Labor Markets: Their Character and Consequences." Industrial Relations Research Association. Proceedings of the Second Annual Meeting. Madison: n.p., 1950. pp. 69-84.

Klein, Lawrence and Mitsugu, Nakomura. "Singularity in the Equation Systems of Econometrics." International Economic Review 3 (September 1962): 274-299.

Kosters, Marvin and Welch, Finis. "The Effects of Minimum Wages on the Distribution of Changes in Aggregate Employment." American Economic Review 62 (June 1972): 323-332.

Lerman, Robert. "An Analysis of Youth Labor Force Participation, School Activity, and Employment Rates." Ph.D. dissertation, Massachusetts Institute of Technology, 1970.

Lovell, Michael. "The Minimum Wage Reconsidered." Western Economic Journal 11 (December 1973): 529-537.

Lovell, Michael. "The Minimum Wage, Teenage Unemployment, and the Business Cycle." Western Economic Journal 11 (December 1972): 414-427.

Mincer, Jacob. "The Distribution of Labor Incomes: A Survey with Special References to the Human Capital Approach." The Journal of Economic Literature 8 (March 1970): 1-26.

Mincer, Jacob. "Labor Force Participation of Married Women: A Study of Labor Supply." In Aspects of Economics, pp. 63-97. Princeton, N.J.: Princeton University Press, 1962.

Mincer, Jacob. "On-the-Job Training: Costs, Returns and Some Implications." Journal of Political Economy, Supplement 70 (October 1962): 50-73.

Mincer, Jacob. "Unemployment Effects of Minimum Wages." National Bureau of Economic Research, 1974. (Mimeographed.)

Mincer, Jacob. "Labor Force Participation and Unemployment: A Review of Recent Evidence." In Prosperity and Unemployment, pp. 73-112. Edited by Robert Gordon and Margaret Gordon. New York: John Wiley and Sons, Inc., 1966.

Moore, Thomas. "The Effect of Minimum Wages on Teenage Unemployment Rates." Journal of Political Economy 79 (July / August 1971): 897-903.

Morse, Dean. The Peripheral Worker. New York: Columbia University Press, 1969.

O'Boyle, Edward. "Job Tenure." Monthly Labor Review 92 (September 1969): 16-23.

Oi, Walter. "Labor as a Quasi-Fixed Factor." Journal of Political Economy 70 (December 1962): 538-555.

Perry, George. "Changing Labor Markets and Inflation." Brookings Papers on Economic Activity (1970): 411-441.

Psacharopoulos, George. Returns to Education: An International Comparison. San Francisco: Jossey-Bass, Inc., Publishers, 1973.

Psacharopoulos, George and Hinchliffe, Keith. "Further Evidence on the Elasticity of Substitution among Different Types of Educated Labor." Journal of Political Economy 80 (July / August 1972): 786-792.

Reich, Michael; Gordon, David; and Edwards, Richard. "A Theory of Labor Market Segmentation." American Economic Review 63 (May 1973): 359-365.

Rummel, R. J. Applied Factor Analysis. Evanston: Northwestern University Press, 1970.

Saben, Samuel. "Occupational Mobility of Employed Workers." Monthly Labor Review 90 (June 1967): 31-38.

Sato, K. "A Two-Level Constant-Elasticity-of-Substitution Production Function." Review of Economic Studies 34 (April 1967): 201-18.

Scoville, James. The Job Content of the U.S. Economy, 1940-1970. New York: McGraw-Hill Book Co., Inc., 1969.

Scully, Gerald. "The Impact of Minimum Wages on the Unemployment Rates of Minority Group Labor." Ohio University, 1968. (Mimeographed.)

Siegal, Sidney. Nonparametric Statistics for the Behavioral Sciences. New York: McGraw-Hill Book Co., Inc., 1956.

Stigler, George. "The Economics of Minimum Wage Legislation." American Economic Review 36 (June 1946): 358-365.

Stigler, George. "Information in the Labor Market." The Journal of Political Economy, Supplement 70 (October 1962): 94-105.

Stone, Richard. "A Comparison of the Economic Structure of Regions Based on the Concept of Distance." Journal of Regional Science 2 (Fall 1960): 1-20.

Strand, Kenneth and Dernburg, Thomas. "Cyclical Variations in Civilian Labor Force Participation." The Review of Economics and Statistics 46 (November 1964): 378-391.

Tella, Alfred. "Labor Force Sensitivity to Employment by Age, Sex." Industrial Relations 4 (February 1965): 69-83.

Theil, Henri. Principles of Econometrics. New York: John Wiley and Sons, Inc., 1971.

Thurow, Lester. Poverty and Discrimination. Washington: The Brookings Institute, 1969.

Torgerson, Warren. Theory and Methods of Scaling. New York: John Wiley and Sons, Inc., 1958.

U.S. Bureau of the Census. Census of Population: 1970, Subject Reports, Occupational Characteristics. Final Report PC(2)-7A. Washington: U.S. Government Printing Office, 1973.

U.S. Bureau of the Census. Public Use Samples of Basic Records from the 1970 Census: Description and Technical Documentation. Washington: U.S. Government Printing Office, 1972.

U.S. Congress. House. Committee on Education and Labor. Federal Labor Laws. 90th Cong., 1st sess., 1967. Washington: U.S. Government Printing Office, 1967.

U.S. Congress. Senate. Committee on Labor and Public Welfare. Legislative History of the Fair Labor Standards Amendments of 1966. 90th Cong., 2nd sess., 1968. Washington: U.S. Government Printing Office, 1968.

U.S. Department of Labor, Bureau of Labor Statistics. Youth Unemployment and Minimum Wages. Washington: U.S. Government Printing Office, 1970.

U.S. Department of Labor. Employment Standards Administration. Handy Reference Guide to the Fair Labor Standards Act. Washington: U.S. Government Printing Office, 1972.

U.S. Department of Labor. Employment Standards Administration. Minimum Wage and Maximum Hours Standards Under the Fair Labor Standards Act. Economic Effects Study. Submitted to Congress, 1972. Washington: U.S. Government Printing Office, 1972.

U.S. Department of Labor. Employment Standards Administration. Table entitled, "Minimum Wage and Overtime Standards Established under the Fair Labor Standards Act, 1938-1974." Washington, April 1974. (Mimeographed.)

U.S. Department of Labor. Employment Standards Administration. Wages and Hours of Work of Nonsupervisory Employees in all Private Nonfarm Industries by Coverage Status under the Fair Labor Standards Act. Economic Effects Study. Submitted to Congress, 1972. Washington: U.S. Government Printing Office, 1972.

Vietorisz, Thomas and Harrison, Bennett. "Labor Market Segmentation: Positive Feedback and Divergent Development." American Economic Review 63 (May 1973): 366-376.

Wachtel, H., and Betsey, C. "Employment at Low Wages." Review of Economics and Statistics 54 (May 1972): 121-129.

Weisskoff, F. B. "Women's Place in the Labor Market." American Economic Review 62 (May 1972): 161-166.

APPENDIX A

THE PERIPHERAL WORKER SEGMENT OF THE LABOR MARKET

It has been recognized for some time that youth are disproportionately concentrated in a small number of low skill jobs that are primarily of a part-time nature. This has led some authors to refer to a youth labor market or a youth favorable segment of the general labor market. The following section presents a superficial examination of those occupations which are important for youth employment. The number of youth in the occupation will serve as a guide for determining its importance for youth employment. The second section deals with an alternative methodology for identifying those occupations that are important for youth employment. The concept of labor market segmentation will underlie most of the discussion. The primary empirical tool used for identifying that segment of the labor market which is most favorable for youth employment will be princ-ipal component analysis with special reference to techniques developed within the framework of factor analysis.

A.1 Occupations Favorable for Youth Employment

Youth favorable occupations comprise that segment of the labor market which is most "important" for youth employment. Three occupational criteria can be used in identifying a youth favorable occupation: 1. a large percentage of the occupation is comprised of youth; 2. a large number of youth are employed in the occupation; and

3. a large percentage of youth are employed in the occupation. The criteria that is selected is totally dependent on the taste of the investigator.[1] For the purpose of this study criteria, 1 and 2 are utilized. An occupation is considered to be important for youth employment if,

I. At least ten thousand 16-17 year olds or 18-19 year olds are employed in the occupation.

II. At least five percent of the occupation is comprised of 16-17 year olds and 18-19 year olds.[2]

The occupations which satisfy conditions I and II for male youth and female youth are listed in Tables A-1 and A-2 and Tables A-3 and A-4, respectively. Before considering the tables, some definitions are in order. The data used in constructing the tables was obtained from the U.S. Bureau of the Census Subject Report, Occupational Characteristics for 1970.[3] The occupational titles and

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[1] It should be obvious that the criteria selected is a function of the investigator's definition of important.

[2] It should be noted that the decision rule used within the selected criteria is also a function of the investigator's definition of important. Twenty thousand or one thousand could just as easily have been used as the decision rule for the first criterion as ten thousand. This observation also applies to the decision rule used for the second criterion.

[3] U.S. Bureau of the Census, Census of Population: 1970, Subject Reports, Occupational Characteristics, Final Report PC(2)-7A (Washington: U.S. Government Printing Office, 1973).

characteristics are familiar even to the casual user of the Bureau's data and require no discussion. However, the weighted values computed from the basic data need to be defined. Adjusted earnings (AE) is defined to be,

$$AE_i = E_i \;/\; W_i \; H_i \tag{A-1}$$

where,

AE	is adjusted earnings
E	is median earnings per year
W	is median weeks worked per year
H	is mean hours worked per week
i	is the ith occupation

Some authors have used adjusted earnings as if it were a reliable measure of the average hourly wage. However, it is very doubtful if adjusted earnings is a good measure of the average hourly wage. Hence, it will not be assigned the attributes of the average hourly wage for use in this study.[4]

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[4] A number of authors, including Alan Fisher, "The Problem of Teenage Unemployment," (Ph.D. dissertation, University of California, Berkeley, 1973); and Arnold Katz, "State Minimum Wages and Labor Markets for Youth," University of Pittsburgh, 1961 (Mimeographed.); who have examined youth unemployment, have defined their estimated wage rates in a manner similar to equation (A-1). However, if adjusted earnings is used as an estimator of the average hourly wage, it is subject to a number of errors of measurement and

Weighted average characteristics can be defined as,

$$W\,C_j = \sum_{i=1}^{n} P_{ij}\,C_i \Big/ \sum_{i=1}^{n} P_{ij} \qquad \text{(A-2)}$$

where,

$W\,C_j$ is the average characteristic weighted by the jth group of cohorts

P_{ij} is the number of cohorts in the jth group employed in the ith occupation

C_i is the characteristic for the ith occupation

n is the number of occupations. For male youth, n = 23 and for female youth, n = 21

Weighted averages were computed for mean hours worked per week, median earnings per year, median school years completed and adjusted earnings. The weights used were the number of 16-17 year old males, 16-17 year old females, 18-19 year old males, 18-19 year old females and all occupational members in the occupation.

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biases. For examples, W and E are measured for a different time period than H. Also H is measured only for a single week and is not averaged over a number of weeks. The bias of the estimator will be dependent on the distribution of the variables and their degree of correlation. For example, if W_i and H_i are positively correlated within the ith occupation, then AE_i will be a positively biased estimator of the average hourly wage. Rather than confronting these problems, I have chosen not to interpret AE as an estimator of the average hourly wage.

A.1.1 Male youth favorable occupations

Those occupations which satisfy conditions I and II for male youth are given in Tables A-1 and A-2. The most striking characteristic of the tables is that no professional, managerial or craft occupations were able to satisfy the conditions. Those occupations which are favorable for male youth employment tend to be found in the sales, clerical, service or labor categories. They exhibit low levels of education and low levels of remuneration. Weighted average years of school completed for the twenty-three occupations is only 11.0 years as compared to 12.3 years for all occupations. Much greater differences are evident for the level of remuneration. Weighted average earnings and weighted average adjusted earnings are 4572 dollars and 2.39 dollars, respectively, for the set of occupations, as compared with 7620 dollars and 3.61 dollars for all occupations. Male youth favorable occupations also tend to be largely of a part-time nature as witnessed by the low mean hours worked per week by their members. Weighted average hours worked per week is only 37.68 hours for the set of occupations as compared to 42.2 hours overall.[5]

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[5]Average characteristics for all occupations were obtained directly from U.S. Bureau of the Census, Occupational Characteristics, and pertain only to male workers.

Table A-1

Male Youth-Employed

Occupation	Total Number		Percent of Occupation		Percent of Age Group	
	16-17 Years Old	18-19 Years Old	16-17 Years Old	18-19 Years Old	16-17 Years Old	18-19 Years Old
Newsboys	31405	4958	48.75	7.69	2.53	0.28
Sales clerks, retail trade	62914	75159	2.78	3.32	5.07	4.31
Cashiers	20830	25831	2.52	3.13	1.67	1.48
Mail handlers (ex. post office)	3904	10301	3.15	8.32	0.31	0.59
Shipping and receiving clerks	6624	20081	1.60	4.86	0.53	1.15
Stock clerks and store keepers	19578	29823	4.32	6.58	1.57	1.71
Auto mechanics	11735	34447	1.44	4.23	0.94	1.97
Garage workers and gas station attendants	85799	86610	20.41	20.61	6.91	4.96
Packers and wrappers (ex. meat)	11358	18939	2.22	3.70	0.91	1.08
Delivery men and route men	24620	39566	4.02	6.47	1.98	2.26
Construction laborers (ex. carpenters' helpers)	17257	35641	3.09	6.40	1.39	2.04
Freight and material handlers	19018	42620	3.57	8.02	1.53	2.44
Gardeners and grounds-keepers (ex. farm)	24546	17758	8.14	5.88	1.97	1.01
Stock handlers	158743	111438	26.97	18.93	12.79	6.39
Vehicle washers and equipment cleaners	18273	14786	15.47	12.52	1.47	0.84

Table A-1
(Cont.)

Occupation	Total Number		Percent of Occupation		Percent of Age Group	
	16-17 Years Old	18-19 Years Old	16-17 Years Old	18-19 Years Old	16-17 Years Old	18-19 Years Old
Farm laborers, wage	63731	53616	8.48	7.13	5.13	3.07
Farm laborers, unpaid family workers	17404	11119	17.59	11.24	1.40	0.63
Cleaners and Charwomen	17565	14418	4.02	3.30	1.41	0.82
Janitors and sextons	65459	59122	5.38	4.86	5.27	3.39
Busboys	42118	18167	44.38	19.14	3.39	1.04
Cooks (ex. private household)	50994	35352	6.14	4.26	4.11	2.02
Dishwashers	36417	19591	21.86	11.76	2.93	1.12
Food counter and fountain work	12747	7445	8.69	5.07	1.20	0.42
Attendants, recreation and amusement	10745	8400	14.95	11.68	.86	.48
Total	833784	795188	.....	.....	67.24	45.50

SOURCE: U.S. Bureau of the Census, Census of Population: 1970, Subject Reports, Occupational Characteristics, Final Report PC(2)-7A (Washington: U.S. Government Printing Office, 1973), pp. 609-636, Table 40.

Table A-2

Characteristics of Occupations Favorable for Employment of Male Youth

Occupation	Mean Hours Worked Per Week	Median School Years Completed	Median Earnings Per Year	Adjusted Earnings	Percent of Occupation: 20-24 Year Old Negro Male	Percent of Occupation: 50-59 Year Old Negro Male
Newsboys	19.4	10.7	795	0.82	0.20	0.22
Sales clerks, retail trade	40.0	12.4	5482	2.74	0.23	0.12
Cashiers	31.9	12.3	3154	1.98	0.20	0.10
Mail handlers (ex . post office)	36.0	12.3	4937	2.74	2.20	1.27
Shipping and receiving clerks	41.3	12.1	6427	3.11	1.77	1.51
Stock clerks and store-keepers	38.8	12.2	6288	3.24	1.46	1.15
Auto mechanics	45.4	11.3	6862	3.02	0.75	1.26
Garage workers and gas station attendants	38.3	11.1	2668	1.50	1.01	1.04
Packers and wrappers (ex. meat)	38.8	10.9	5336	2.75	1.14	0.96
Delivery men and route men	42.9	11.9	6582	3.07	1.16	1.30
Construction laborers (ex. carpenters' helpers)	38.1	9.8	5213	2.81	1.90	5.03
Freight and material handlers	39.1	10.9	5660	2.89	2.77	3.17
Gardeners and grounds-keepers (ex. farm)	34.6	9.7	3792	2.19	1.13	3.76
Stock handlers	29.6	11.3	2114	1.57	1.26	0.51

Table A-2
(Cont.)

Occupation	Mean Hours Worked Per Week	Median School Years Completed	Median Earnings Per Year	Adjusted Earnings	Percent of Occupation: 20-24 Year Old Negro Male	Percent of Occupation: 50-59 Year Old Negro Male
Vehicle washers and equipment cleaners	34.8	10.4	3629	2.10	2.69	4.11
Farm laborers, wage	42.3	8.7	2493	1.19	1.71	3.28
Farm laborers, unpaid family workers	41.7	10.8	1100	0.53	0.43	0.27
Cleaners and charwomen	36.1	9.8	4063	2.25	1.23	3.25
Janitors and sextons	37.0	9.9	4771	2.58	1.35	4.83
Busboys	23.1	10.8	943	1.58	0.99	0.32
Cooks (ex. private household)	39.1	10.9	4076	2.08	0.55	1.02
Dishwashers	25.9	10.5	1238	1.57	0.97	0.85
Food counter and fountain workers	26.5	11.1	1413	1.51	0.24	0.18
Attendants, recreation and amusement	29.8	12.0	1923	1.57	0.70	0.65
Weighted Averages						
All members	37.68	11.03	4572	2.39	....	....
16-17 year olds	33.94	10.87	3284	1.93	....	....
18-19 year olds	36.78	11.25	4009	2.18	....	....

SOURCE: U.S. Bureau of the Census, Census of Population: 1970, Subject Reports, Occupational Characteristics, Final Report PC(2)-7A (Washington: U.S. Government Printing Office, 1973), pp. 747-774, Table 45; pp. 59-86, Table 5; pp. 284-311, Table 16; pp. 609-636, Table 40.

Within the set of male youth favorable occupations, the distribution of the younger group of cohorts across occupations tends to be noticeably different from the distribution of the older group of cohorts. This is not immediately evident from a cursory examination of the list of occupations. Of the seven occupations most heavily dominated by 16-17 year olds, six are also dominated by 18-19 year olds.[6] However, as exhibited by the weighted average characteristics, the younger group of cohorts tend to be more heavily concentrated in occupations with low levels of education and low levels of remuneration than the older group of cohorts. Weighted average years of school completed is 10.87 years for 16-17 year olds as compared with 11.25 years for 18-19 year olds.[7] The younger group of cohorts also tend to be much more heavily concentrated in those occupations with low mean hours worked per week than the older group of cohorts. Weighted average

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[6]Dominance is rather loosely defined as occurring when over ten percent of the occupation is comprised of any one group of cohorts.

[7]Care should be taken in interpreting the weighted averages. This does not imply that 16-17 year olds employed in the set of occupations have completed 10.87 years of education on the average. Rather, it simply means that the younger group of cohorts are more heavily concentrated in occupations with a low value for median years of school completed than the older group of cohorts.

hours of work is 33.94 hours for 16-17 year olds as compared to 37.68 hours for 18-19 year olds.

One of the more interesting implications of human capital theory is that as the length of the investment period is increased, the dispersion of quality differences in investors will increase.[8] Since the older group of cohorts have had one to two years longer to invest in themselves than the younger group, it can be expected that they will form a more heterogeneous group. Hence, as a group, they should be capable of holding a wider range of jobs than the younger group of cohorts. The younger group of cohorts are much more heavily concentrated in the set of youth favorable occupations than the older group. The set of twenty-three occupations accounts for 67.24 percent of all 16-17 year olds employed. However, the set is capable of accounting for only 45.62 percent of all 18-19 year old males employed. This is simply indicative of the wider dispersion of the older group of cohorts throughout the labor market.[9]

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[8] For example, see Jacob Mincer, "The Distribution of Labor Incomes: A Survey with Special Reference to the Human Capital Approach," The Journal of Economic Literature 8 (March 1970): 1-26.

[9] One does not need to rely on human capital theory to account for this result as long as employers use the level of education and former job experience as guides to expected quality. The older group of cohorts will have a higher level of expected quality simply because they have had more time to acquire education and job experience. This means a wider range of jobs will be open to them. It should also be noted that many jobs are closed to the younger group of cohorts because of a commitment to school. After graduation or dropping out, a wider range of jobs are available to them simply because full-time jobs can now be included in their universe of choice.

A.1.2 Female youth favorable occupations

Those occupations which satisfy conditions I and II for female youth are listed in Tables A-3 and A-4. The occupations which are favorable for the employment of female youth are concentrated in a narrower segment of the labor market than those for male youth. The occupations which satisfy the conditions for female youth are found only in the clerical, service and private household worker categories. They tend to exhibit levels of education and remuneration below the average for all female workers. Weighted average years of school completed for the twenty-one occupations is 12.28 years as compared to 12.4 years overall.[10] Weighted average earnings and weighted average adjusted earnings are only 3293 dollars and 1.98 dollars, respectively, for the occupational set, as opposed to 3646 dollars and 2.09 dollars for all occupations. Occupations favorable for female youth employment tend to be largely of a part-time nature, as witnessed by the low mean hours worked per week by their members. Weighted average hours worked per week is only 33.33 hours for the set of youth favorable occupations as compared to 34.8 hours overall.

It is important to note that the set of female youth favorable occupations differ from the total set of occupations to much less of a degree than male youth favorable

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[10] Average characteristics for all occupations were obtained directly from U.S. Bureau of the Census, <u>Occupational Characteristics</u>, and pertain only to female workers.

Table A-3

Female Youth-Employed

Occupation	Total Number 16-17 Years Old	Total Number 18-19 Years Old	Percent of Occupation 16-17 Years Old	Percent of Occupation 18-19 Years Old	Percent of Age Group 16-17 Years Old	Percent of Age Group 18-19 Years Old
Sales clerks, retail trade	112983	127101	4.99	5.61	14.52	8.17
Bank tellers	1418	13927	0.56	5.54	0.18	0.89
Cashiers	73203	81535	8.88	9.89	9.40	5.24
Counter clerks (ex. food)	7922	13531	3.55	6.06	1.01	0.87
File clerks	18663	45765	5.14	12.62	2.39	2.94
Library attendant	8390	14217	6.68	11.33	1.07	0.91
Keypunch operators	1920	23020	0.69	8.30	0.24	1.48
Receptionists	8423	28879	2.75	9.45	1.08	1.85
Secretaries	22657	157033	0.83	5.80	2.91	10.09
Stenographers	841	10073	0.65	7.83	0.10	0.64
Telephone operators	10025	47119	2.41	11.35	1.28	3.02
Typists	26383	113863	2.69	11.61	3.39	7.32
Miscellaneous and not specified clerical workers by industry Wholesale and retail trade	7426	15981	2.98	6.41	0.95	1.02
Finance, insurance, and real estate	2558	13587	1.39	7.40	0.32	0.87
Professional and related services	5102	15841	2.58	8.01	0.65	1.01
Food counter and fountain workers	15700	15345	10.70	10.46	2.01	0.98
Waiters	105439	92483	10.34	8.98	13.67	5.94

Table A-3
(Cont.)

Occupation	Total Number 16-17 Years Old	Total Number 18-19 Years Old	Percent of Occupation 16-17 Years Old	Percent of Occupation 18-19 Years Old	Percent of Age Group 16-17 Years Old	Percent of Age Group 18-19 Years Old
Dental assistants	4615	11540	5.09	12.75	0.59	0.74
Nursing aides, orderlies and attendants	20884	43641	2.88	6.03	2.68	2.80
Hairdressers and cosmetologists	3822	22957	0.79	4.75	0.49	1.47
Child care workers, private household	43666	19659	19.16	8.62	5.61	1.26
Total	503040	927097	....	....	64.54	59.51

SOURCE: U.S. Bureau of the Census, Census of Population: 1970, Subject Reports, Occupational Characteristics, Final Report PC(2)-7A (Washington: U.S. Government Printing Office, 1973), pp. 609-636, Table 40.

Table A-4

Characteristics of Occupations Favorable for Employment of Female Youth

Occupation	Mean Hours Worked Per Week	Median School Years Completed	Median Earnings Per Year	Adjusted Earnings	Percent of Occupation: 20-24 Year Old Negro Female	Percent of Occupation: 50-59 Year Old Negro Female
Sales clerk, retail trade	30.5	12.2	2208	1.51	0.43	0.29
Bank tellers	35.9	12.6	4179	2.33	0.98	0.07
Cashiers	30.9	12.1	2431	1.67	1.14	0.31
Counter clerks (ex. food)	34.2	12.3	2938	1.72	0.86	0.43
File clerks	33.9	12.4	3430	2.05	2.99	0.70
Library attendants	25.2	13.1	2058	1.79	1.42	0.53
Keypunch operators	37.1	12.5	4597	2.48	3.60	0.27
Receptionists	33.3	12.6	3376	2.03	1.39	0.28
Secretaries	36.1	12.7	4803	2.66	0.96	0.16
Stenographers	37.1	12.6	5246	2.83	1.61	0.23
Telephone operators	36.2	12.4	4241	2.34	3.75	0.26
Typists	34.5	12.5	4020	2.33	3.16	0.29
Miscellaneous and not specified clerical workers by industry Wholesale and retail trade	33.7	12.4	3256	1.93	0.84	0.31
Finance, insurance and real estate	36.0	12.5	4363	2.42	1.80	0.15
Professional and related services	32.1	12.7	3366	2.10	2.06	0.82
Food counter and fountain workers	25.4	11.5	1382	1.49	1.08	1.05

Table A-4
(Cont.)

Occupation	Mean Hours Worked Per Week	Median School Years Completed	Median Earnings Per Year	Adjusted Earnings	Percent of Occupation: 20-24 Year Old Negro Female	Percent of Occupation: 50-59 Year Old Negro Female
Waiters	29.9	11.5	1662	1.33	0.79	0.38
Dental assistants	34.6	12.5	3405	1.97	0.77	0.18
Nursing aides, orderlies and attendants	36.2	11.8	2969	1.64	3.15	2.53
Hairdressers and cosmetologists	34.5	12.3	3041	1.76	0.46	1.39
Child care workers, private household	27.4	10.7	671	0.91	1.16	2.56
Weighted averages						
All members	33.3	12.28	3293	1.98	....	....
16-17 year olds	31.16	11.86	2399	1.63	....	....
18-19 year olds	33.25	12.27	3266	1.98	....	....

SOURCE: U.S. Bureau of the Census, Census of Population: 1970, Subject Reports, Occupational Characteristics, Final Report PC(2)-7A (Washington: U.S. Government Printing Office, 1973), pp. 747-774, Table 45; pp. 59-86, Table 5; pp. 284-311, Table 16; pp. 609-636, Table 40.

occupations. Differences in remuneration, education and hours worked are not as great as in the case of male youth favorable occupations. This is just another way of saying that occupations populated by female youth tend to be like occupations populated by female adults, while occupations populated by male youth tend to be quite different from occupations populated by male adults.[11]

Within the set of female youth favorable occupations, the distribution of the younger group of cohorts across occupations tends to be noticeably different from the distribution of the older group of cohorts. This is not immediately evident from a cursory examination of the list of occupations. All five of the occupations dominated by 16-17 year olds are also dominated by 18-19 year olds.[12] However, as exhibited by the weighted average characteristics, the younger group of cohorts tends to be more heavily concentrated in occupations with low levels of education and low levels of remuneration than the older group of cohorts.

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[11] This is to be expected if female workers are "discriminated" against, but to a lesser degree than youth, and female youth are "discriminated" against as youth and not as females. Then female youth, upon becoming adults, "move" a shorter distance in the job hierarchy than male youth.

[12] In keeping with the arbitrary nature of definitions used in this section, dominance is redefined as occurring when over five percent of the occupation is comprised of any one group of cohorts.

Weighted average years of school completed is 11.86 years for 16-17 year olds as opposed to 12.27 years for 18-19 year olds. Much greater differences are evident for the level of remuneration. Weighted average earnings and weighted adjusted earnings are, respectively, 2399 dollars and 1.63 dollars for 16-17 year olds as opposed to 3266 dollars and 1.98 dollars for 18-19 year olds. The younger group of cohorts also tends to be much more heavily concentrated in those occupations with low mean hours worked per week than the older group of cohorts. Weighted average hours of work is only 31.16 hours for the younger group of cohorts as compared to 33.25 hours for the older group.

It is interesting to note that both the older group of cohorts and the younger group are heavily concentrated in the set of occupations favorable for female youth employment. The set of occupations is capable of accounting for 64.54 percent of all 16-17 year olds employed and 59.51 percent of all 18-19 year olds employed. However, it should be noted that these same occupations are capable of accounting for 42 percent of all females employed. This is just another indication that occupations that are favorable for female youth employment are also important sources of employment for all females.

A.1.3 An overview of the occupational set

It has been shown that youth are disproportionately concentrated in a few occupations. These occupations, which are primarily of a part-time nature, tend to exhibit low levels of education and remuneration. Occupations which are important for male youth employment tend to be quite different from those that are important for the employment of female youth. Within the sex-specific youth occupational sets, the younger group of cohorts tends to be more concentrated in occupations that exhibit low hours worked, low levels of education and remuneration than the older group of cohorts. Between sex-specific youth occupational sets, male youth favorable occupations provide a greater level of remuneration and are less of a part-time nature than female youth favorable occupations. This is true when one is considering all occupational members, only the older group of cohorts, or only the younger group.

The above conclusions were reached by employing a methodology which relied on the percentage of the occupation that is youth as a guide to the occupation's favorability for youth employment. This permits one to speak of a set of occupations favorable for youth employment. However, this set of occupations cannot be conceptualized as a youth labor market. To do so would exclude 40-60 percent of youth from the youth labor market. Neither can the set of occupations be considered the principal segments of a youth labor market. Such an approach implicitly assumes the existence of a youth labor market. In order to accept occupations with a high percentage of youth in them as being the principal segments of a youth labor market, one must accept, a priori, the existence of a labor market for youth. The approach is analogous to taking those occupations with a high percentage of grandmothers in them and designating them as the principal segments of a grandmother labor market. Such a conclusion would be valid only if the existence of a unique labor market for grandmothers had already been shown to exist.

If the existence of a youth labor market is accepted, using the percentage of youth in various occupations to identify its principal segments is very misleading. Since labor markets overlap, occupations which are in the set of youth favorable occupations may also be important sources of employment for a variety of other demographic-educational groups. Referring to Table A-2, it can be readily observed that construction laborer, janitor and sexton, vehicle washer and equipment cleaner, and gardener and groundskeeper are occupations which are favorable for the employment of 50-59 year old Negro males as well as male youth. Thus, within these occupational groups, male youth are competing with 50-59 year old Negro males for employment. Yet in other occupations such as newsboy, cashier, and food counter and fountain worker, male youth are not competing directly with 50-59 year old Negro males for employment.[13] When examining only one demographic group, it is impossible to determine if an occupation is an important source of employment only for youth, or if it is an important source of employment for a number of worker groups.

Moreover, the methodology relies on only one labor market variable; i.e., the number of workers of various groups in the occupation. Selection was not based on the level of renumeration or the mean number of hours worked per week. These labor market variables were referred to after the occupational sets were formed. However, it may be more appropriate to include such labor market variables in the selection criteria rather than delegating to them the role of mere summary statistics.

The occupational sets derived in this section have proved very useful in examining the character of youth employment. However, they are also highly restrictive. They cannot be referred to as labor markets or segments of labor markets. Nor do they give a very complete picture of who competes for jobs within the occupational sets. They are also one dimensional. That is to say, they were constructed using only one labor market variable as a guide. Because of these shortcomings, it may prove beneficial to

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[13]By referring to Table A-4, similar conclusions can be reached with regard to 20-24 year old black females.

examine the structure of youth employment within an alternative framework.

A.2 The Principle Components of Occupational Structure

Since the late nineteen-sixties a great deal of attention has been directed toward the concept of labor market segmentation.[14] A literal deluge of econometric studies have emerged which attempt to analyze the nature of labor market segmentation and measure its dimensions.[15] The reaearch has fairly conclusively documented the existence of persistent divisions among workers. Segmentation has been observed occurring by color, sex, age and level of education. Each segment appears to operate as a separate labor market with its own unique wage structure, working conditions and stability of employment.

Since 16-17 year old youth form a more homogeneous group in terms of level of education, work experience,

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[14] The concept of labor market segmentation dates back to the nineteenth century pronouncement of non-competing groups by Cairnes. See J. E. Cairnes, Some Leading Principals of Political Economy, Newly Expounded (New York: Harper, 1874).

[15] See, for example, H. Wachtel and C. Betsey, "Employment at Low Wages," Review of Economics and Statistics 54 (May 1972): 121-129; and F. B. Weisskoff, "Women's Place in the Labor Market," American Economic Review 62 (May 1972): 161-166.

training, and so forth, than other demographic groups, it is not surprising to find them more concentrated in a few occupations than other demographic groups. Because they have not had time to acquire high levels of education or work experience and training, as a group they can compete for only a limited number of jobs. If they are committed to school, they must by necessity seek employment in occupations which permit only part-time employment. This further reduces the set of jobs that they can successfully compete for as a group. If the remainder of the labor force participants form a highly heterogeneous group, then one would expect to find a segment of the labor market favorable to youth employment nested in the general labor market.[16] However, such a state of the world does not exist. Past studies indicate that labor market segmentation exists for a wide range of highly heterogeneous groups.

The existence of labor market segmentation for highly heterogeneous groups poses problems for a neoclassical framework. Orthodox economic theory assumes that profit

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[16]This assumes a "perfect" type of heterogeneity. Thus, if members are grouped as to two characteristics, then the distribution of other characteristics between the groups must be identical. This rules out the possibility of all blacks having low education and all whites having high education, all females having no technical training and all males having technical training, and so forth.

maximizing employers evaluate workers in terms of individual characteristics and not group characteristics. Hence, it predicts that labor market differences among groups will decline overtime as the dynamic competitive process is worked out. Past attempts to reconcile the empirical results with the existing body of theoretical knowledge have had their roots in sociology or a "divide and conquer" theory of monopoly capitalism.[17] No attempt will be made here to advance the state of the theory of labor market segmentation for <u>all</u> groups. The much less ambitious goal of identifying the principal segments of the labor market is proposed. Past studies have restricted themselves to a single demographic group and a narrow set of labor market variables. The methodology employed here looks at all demographic groups and a wide range of labor market variables. Thus, if labor market segmentation for groups other than youth is observed, its cause will go largely undiscussed.

The primary goal of this section is to facilitate the development of an occupational classification system

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[17] See, for example, Michael Reich, David Gordon, and Richard Edwards, "A Theory of Labor Market Segmentation," <u>American Economic Review</u> 63 (May 1973): 359-365; and Thomas Vietorisz and Bennett Harrison, "Labor Market Segmentation: Positive Feedback and Divergent Development," <u>American Economic Review</u> 63 (May 1973): 366-376. Most theories of labor market segmentation are in their infancy and there is currently no consensus on the best approach to the problem.

that is founded on a broad base of labor market variables. An attempt will be made to identify the principal structures of the labor market and to scale occupations along these structures. No attempt will be made to unequivocally commit an occupation to any one structure. Rather, all occupations are a member of any one segment of the labor market with a set of scores defining their position in that segment. Such a classification system is dramatically different from the aggregated classification system of the census or Scoville's reclassification of detailed occupations along job family and job content level lines.[18] The system proposed here recognizes that the characteristics of occupations are so multi-dimensional that occupations will overlap structures.

The primary objective of such an occupational classification system is to identify the major, linearly independent, basic dimensions of labor market segmentation that span the labor market characteristic space. In other words, one is seeking to identify the principal structures that are capable of defining the systematic variations in labor market variables by occupation.

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[18]See James Scoville, The Job Content of the U.S. Economy, 1940-1970 (New York: McGraw-Hill Book Co., Inc., 1969).

The concept of basic dimensions can be illustrated by considering two sets of labor market variables, X_1 and X_2. Assume that there is strong intraset correlation but no interset correlation. Each set of variables delineates a basic dimension of the variable space. Through a linear combination of the variables in X_1, a new variable, S_1, can be formed. Likewise, a new variable, S_2, can be formed through a linear combination of the variables in X_2. Each of these new variables contains a concise embodiment of one form of systematic variation in the original labor market variable space. The two basic dimensions are said to "span" the labor market variable space in that any original vector in X_1 can be reproduced from S_1 and any original vector in X_2 can be reproduced from S_2.

Using labor market data by occupations, it is impossible to believe that variables will neatly fit into distinct sets as in the above example. It is expected that all variables will make a contribution to each of the basic dimensions, with the degree of contribution varying between basic dimensions.

A.2.1 The principal component model

The chief empirical tool used in this investigation is the principal component model with special reference to factor analysis and factor rotation techniques.[19] Principal component analysis is capable of uncovering the independent sources of variation within the set of data. When interdependencies exist in the data, the principal component model can be used to ask the question, "Can the same amount of variation in the data be represented equally well by dimensions smaller in number than the number of variables in the original data matrix?" The dimensions uncovered by principal component analysis can be interpreted as measures of the amount of systematic variation in the data matrix. The degree to which interdependencies exist in the data can be measured by the strength of some minimum number of dimensions. Principal component analysis seeks to determine if order, pattern and regularity exist in the data matrix.

The primary goal of component analysis, viewed in the context of the objective of this section, is to produce

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[19] Most of the statistical techniques used in this study are very familiar to economists and need no discussion. However, principal component analysis and factor analysis are seldom used in the discipline. They may be completely unfamiliar to some readers. For this reason, their properties are briefly discussed. Most of the concepts discussed here can be found in R. J. Rummel, Applied Factor Analysis (Evanston: Northwestern University Press, 1970); Harry Harman, Modern Factor Analysis (Chicago: The University of Chicago Press, 1970); Henri Theil, Principles of Econometrics (New York: John Wiley and Sons, Inc., 1971), pp. 46-55; and J. Johnston, Econometric Methods (New York: McGraw-Hill Book Company, Inc., 1972), pp. 322-330.

a more parsimonious description of the data matrix. It disentangles the patterns of interrelationship between variables into primary independent dimensions. It is concerned with the total variance of the variables.

The principal components model can be stated formally as:

$$
\begin{aligned}
z_1 &= a_{11} X_1 + a_{21} X_2 + \ldots + a_{k1} X_k + \ldots + a_{m1} X_m \\
z_2 &= a_{12} X_1 + a_{22} X_2 + \ldots + a_{k2} X_k + \ldots + a_{m2} X_m \\
&\vdots \\
z_j &= a_{ij} X_1 + a_{2j} X_2 + \ldots + a_{kj} X_k + \ldots + a_{mj} X_m \\
&\vdots \\
z_p &= a_{1p} X_1 + a_{2p} X_2 + \ldots + a_{kp} X_k + \ldots + a_{mp} X_m
\end{aligned}
$$

where, X_k is the kth standardized data vector (each deviation from the sample mean is divided by $\sqrt{n}$ times the sample standard deviation of that variable) with the dimension n x 1, and n is the number of observations, z_j is the jth principal component vector with the dimension n x 1, a_{kj} is the weight of the kth data vector on the jth principal component, p is the number of principal components, and m is the number of variables. In the general case, m = p.

Principal components analysis can be used to identify the major, uncorrelated dimension of a data matrix. The X's are transformed to a new set of variables which are pairwise uncorrelated. The first variable will have the maximum possible variance among those uncorrelated with the second, and so forth.

State the principal component model in matrix notation such that,

$$Z_{n \times p} = X_{n \times m} A_{m \times p} \tag{A-3}$$

The model can be solved for any data matrix by a series of interactions. The method of solution given here is but one of several. However, it is highly illustrative as to the characteristics of the model. Define the first principal component as,

$$z_1 + X a_1 \tag{A-4}$$

where z is an n element vector, X is an n x m data matrix, and a_1 is an m element vector of weights. The first principal component should have the maximum possible variance. Since the elements of the data matrix are in standard scores, this means maximizing the sum of squares. The additional condition, $a_1' a_1 = 1$ is imposed to control for an upper bounds to the sum of squares. It is simply a means of scaling. The problem can be reduced to a simple constrainted maximization problem. The sum of squares is maximized subject to the scaling condition such that,

$$V = a_1' X' X a_1 - \lambda_1 (a_1' a_1 - 1) \tag{A-5}$$

where λ_1 is the Lagrange multiplier. Taking the first partial derivative with respect to a_1 and setting it equal to zero gives,

$$(X' X) a_1 = \lambda_1 a_1 \tag{A-6}$$

Equation (A-6) is the familiar eigenvalue, eigenvector problem, where λ_1 is the eigenvalue or latent root and a_1 is the eigenvector or the latent vector. Premultiplying by a_1' and remembering that $a_1' a_1 = 1$,

$$z_1' z_1 = a_1' X' X a_1 = \lambda_1 a_1' a_1 = \lambda_1 \tag{A-7}$$

where λ_1 is the largest latent root of X' X. By definition, X' X is positive definite and, thus, has positive latent roots. The first principal component of X is then z_1.

The second principal component is solved for in an analogous manner. Define the second principal component as,

$$z_2 = X a_2 \tag{A-8}$$

The second principal component should have the maximum possible variance among those variables uncorrelated with the first principal component. This implies $a_1' a_2 = 0$. This means maximizing the sum of squares subject to the scaling constraint and the condition that the principal components are uncorrelated such that,

$$V = a_2' X' X a_2 - \lambda_2 (a_2' a_2 - 1) - \mu(a_1' a_2) \tag{A-9}$$

Taking the first partial derivative with respect to a_1, setting it equal to zero and doing a few simple manipulations gives,

$$z_2' z_2 = a_2' X' X a_2 = \lambda_2 a_2' a_2 = \lambda_2 \tag{A-10}$$

and λ_2 is the second largest latent root of $X' X$ and the second principal component is then z_2. The analysis proceeds in this way for each of the $m = p$ roots of $X' X$.

In order to satisfy the general goal of parsimony, all m possible components are seldom extracted. In general $m > p$. In the usual case, the first few principal components are capable of reproducing a large percentage of the variance in the original data matrix. The problem is selecting a trade-off point between parsimony and variance explanation. While the number of principal components problem has no general solution, a number of decision criteria have been laid down.[20] The eigenvalue one criteria was employed in this study. This criterion means that the extraction of principal components is terminated when the value of the eigenvalue falls below one. The p principal components are then given by the n x p matrix Z,

$$Z = X A \tag{A-11}$$

The relationship between the principal components model and the factor analysis model and the correlation matrix is straightforward. The principal components model can be reexpressed as,

$$X = Z A' \tag{A-12}$$

It has been shown by Johnston that,[21]

$$Z' Z = A' X' X A = \Lambda \tag{A-13}$$

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[20] For a discussion of the set of possible decision criteria that have been suggested by various authors, see R. J. Rummel, Applied Factor Analysis, pp. 349-367.

[21] J. Johnston, Econometric Methods, p. 324.

where Λ is a p x p matrix with eigenvalues along its principal diagonal and zeros elsewhere. Taking the sum of squares of (A-12) and substituting from (A-13),

$$X' X = A Z' Z A' = A \Lambda A' \qquad \text{(A-14)}$$

In factor analysis, the matrix of factor loadings (F) is simply equal to the eigenvector matrix (A) with each column eigenvector multiplied by the square root of its corresponding eigenvalue. Thus,

$$X' X = F F' \qquad \text{(A-15)}$$

However, X' X is nothing more than the correlation matrix (R) so that,

$$R = F F' \qquad \text{(A-16)}$$

which is the fundamental theorem of factor analysis. The rescaling of the eigenvectors also affects the principal components. These now will be referred to as the matrix of factor scores (S) so as to maintain conformity with the factor analysis framework.

A.2.2 The data base

The occupational variables selected for use in this study include: percentage of the experienced civilian labor force who are white males, Negro males, other than white or Negro males, white females, Negro females and other than white or Negro females; percentage of the experienced civilian labor force who are unemployed, unemployed males and unemployed females; and percentage of the stock of workers who are currently not in the labor force (NLF), males NLF and females NLF.[22]

For five of the occupational specific variables, percentage frequency distributions were utilized. Percentage frequency distributions were used to capture the variance and skew of the variables within occupational groups. This information would have been lost if a central tendency measure had been employed. The percentage frequency distribution was employed for the ages of the experienced civilian labor force, the years of school completed by the experienced civilian labor force, the number of weeks worked in 1969 by the experienced civilian labor force, the number of hours worked by persons employed in the week prior to enumeration and the earnings in 1969 of the experienced civilian labor force.

The stock of workers attached to a given occupation and the corresponding NLF rate for the occupation are

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[22]The data base was constructed from U.S. Bureau of the Census, Occupational Characteristics.

concepts that are only rarely encountered in labor market studies. Occupations can be conceptualized as having a stock of former workers attached to them. The stock of former workers are persons currently not in the labor force, but who were employed in the occupation when they last worked. The total stock of workers attached to an occupation is simply the stock of employed persons plus the stock of former workers. The NLF rate is the ratio of the stock of former workers to the total stock of workers. In computing this ratio, former workers for 1960 to 1970 were used.

It should be noted that there is a conceptual problem with the NLF rate. It is a measure based on a one way movement, from employment to not in the labor force. There is no way of knowing whether or not the person returns to the same occupation when he reenters the labor force. The same problem exists with the unemployment rate by occupations. It is a measure based on a one way movement, from employment to unemployment. When the worker moves from unemployment to employment, it need not be employment in the occupation from which he became unemployed.

A number of qualifications about other variables should also be made. The earnings distribution and the weeks worked distribution are for 1969. Thus, for occupations which contain highly mobile workers, the earnings variables and the weeks worked variables are somewhat distorted. Also, the number of occupational members vary greatly between occupations. This creates sampling variability problems with regard to occupations that are sparsely populated. Altogether, 506 occupational categories were utilized in the study.

The principal component model and the factor analysis model both assume a bivariate normal distribution. Each variable in the data base was tested for normality using the Kolmogorov-Smirnov one-sample test.[23] The distribution of the variable across occupations was found to be significantly different from normal at the five percent level for all sixty-one variables. The distribution of variables across cases was normalized using a basic grouping algorithm. While a univariate normal distribution is not sufficient for the bivariate distribution to be normal, it does increase the likelihood.

A.2.3 Evidence of labor market segmentation

The principal axis method of factor analysis was applied to the product moment correlation matrix. Table A-5

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[23]The Kolmogorov-Smirnov one-sample test is considerable more powerful than a Chi-Squared goodness of fit test. For a discussion, see Sidney Siegal, Nonparametric Statistics for the Behavioral Sciences (New York: McGraw-Hill Book Co., Inc., 1956), pp. 47-52.

TABLE A-5

UNROTATED FACTOR MATRIX

OCCUPATIONAL CHARACTERISTIC	FACTOR 1	2	3	4	5	6	7	8	9	10
PERCENT WHITE MALE	0.746**	-0.007	-0.274*	-0.317*	-0.233	-0.179	0.059	-0.169	0.110	-0.071
PERCENT BLACK MALE	-0.753**	0.001	0.344*	0.264*	0.202	0.155	-0.032	0.173	-0.132	0.036
PERCENT OTHER MALE	-0.242	-0.041	-0.332*	0.255*	0.299*	0.339*	-0.190	-0.068	0.133	0.289*
PERCENT WHITE FEMALE	0.470*	0.165	-0.311*	-0.446*	-0.289*	-0.403*	0.124	-0.126	0.066	0.169
PERCENT BLACK FEMALE	-0.487*	-0.135	0.345*	0.425*	0.255*	0.361*	-0.091	0.135	-0.091	-0.170
PERCENT OTHER FEMALE	-0.033	-0.165	-0.261*	0.159	0.352*	0.330*	-0.148	-0.196	0.253*	-0.022
PERCENT 16 - 17 YEAR OLDS	-0.797**	0.102	-0.101	-0.135	-0.240	0.124	-0.103	0.025	0.108	0.006
PERCENT 18 - 19 YEAR OLDS	-0.773**	0.400*	-0.005	-0.184	-0.124	0.062	-0.170	0.005	0.093	-0.037
PERCENT 20 - 24 YEAR OLDS	-0.505**	0.766**	-0.075	-0.178	0.066	0.157	0.005	-0.017	-0.005	-0.056
PERCENT 25 - 29 YEAR OLDS	0.259*	0.795**	0.002	0.158	0.014	0.254*	0.225	-0.052	-0.011	-0.046
PERCENT 30 - 34 YEAR OLDS	0.555**	0.378*	-0.013	0.484*	-0.006	0.165	0.266*	-0.014	0.108	0.178
PERCENT 35 - 39 YEAR OLDS	0.616**	0.060	0.034	0.532**	0.050	-0.037	0.219	-0.003	0.183	0.275*
PERCENT 40 - 44 YEAR OLDS	0.646**	-0.288*	0.150	0.337*	0.061	-0.162	0.141	-0.009	0.152	0.296*
PERCENT 45 - 49 YEAR OLDS	0.516**	-0.479*	0.298*	0.152	0.140	-0.288*	0.018	-0.160	0.137	0.219
PERCENT 50 - 54 YEAR OLDS	0.296*	-0.708**	0.374*	0.002	0.180	-0.206	0.000	-0.159	0.018	0.127
PERCENT 55 - 59 YEAR OLDS	0.073	-0.823**	0.360*	-0.138	0.167	-0.106	0.061	-0.067	-0.057	-0.006
PERCENT 60 - 62 YEAR OLDS	-0.029	-0.836**	0.257*	-0.146	0.177	-0.006	0.031	-0.065	-0.116	-0.077
PERCENT 63 - 64 YEAR OLDS	0.007	-0.852**	0.106	-0.152	0.159	0.060	0.062	-0.028	-0.186	-0.074
PERCENT 65 - 69 YEAR OLDS	-0.151	-0.853**	-0.111	-0.136	0.062	0.102	0.106	-0.063	-0.078	-0.061
PERCENT 70 - ++ YEAR OLDS	-0.131	-0.755**	-0.285*	-0.176	0.025	0.112	0.129	-0.074	-0.009	-0.104
PERCENT WITH 00 - 04 YEARS OF EDUCATION	-0.611**	-0.329*	0.521**	0.151	-0.139	0.143	0.004	0.005	0.049	-0.033
PERCENT WITH 05 - 07 YEARS OF EDUCATION	-0.580**	-0.339*	0.599**	0.107	-0.201	0.042	0.023	-0.002	0.070	0.017
PERCENT WITH 8 YEARS OF EDUCATION	-0.501**	-0.350*	0.654**	-0.004	-0.192	-0.023	-0.002	-0.011	0.088	0.087
PERCENT WITH 09 - 11 YEARS OF EDUCATION	-0.627**	-0.102	0.420*	-0.066	-0.342*	-0.099	-0.099	-0.021	0.092	0.081
PERCENT WITH 12 YEARS OF EDUCATION	-0.057	0.378*	0.218	-0.549**	0.141	-0.076	-0.221	-0.163	0.114	0.286*
PERCENT WITH 13 - 15 YEARS OF EDUCATION	0.390*	0.231	-0.519**	-0.303*	0.142	0.167	-0.225	-0.292*	-0.054	0.110
PERCENT WITH 16 YEARS OF EDUCATION	0.576**	-0.075	-0.604**	0.094	0.213	0.118	-0.031	-0.160	-0.027	-0.021
PERCENT WITH 17 - ++ YEARS OF EDUCATION	0.516**	-0.113	-0.644**	0.126	0.205	0.138	0.089	-0.125	-0.025	-0.093
PERCENT WHO WORKED 50 - 52 WEEKS	0.855**	-0.043	0.230	-0.137	0.161	0.037	-0.141	0.091	0.255*	-0.093
PERCENT WHO WORKED 40 - 49 WEEKS	-0.612**	0.038	0.093	0.221	-0.133	-0.087	0.460*	-0.097	-0.379*	0.070
PERCENT WHO WORKED 27 - 39 WEEKS	-0.812**	0.039	-0.206	0.155	-0.111	-0.016	0.185	-0.152	-0.226	0.145
PERCENT WHO WORKED 14 - 26 WEEKS	-0.851**	0.141	-0.350*	0.019	-0.082	0.024	-0.013	-0.057	-0.043	0.054
PERCENT WHO WORKED 01 - 13 WEEKS	-0.853**	-0.027	-0.344*	0.006	-0.024	0.083	-0.043	-0.073	-0.026	0.070
PERCENT WHO WORKED 01 - 14 HOURS	-0.612**	-0.234	-0.566**	-0.013	-0.094	0.096	0.045	-0.065	-0.194	0.131
PERCENT WHO WORKED 15 - 29 HOURS	-0.677**	-0.091	-0.554**	-0.017	-0.093	-0.005	0.154	-0.009	-0.158	0.114
PERCENT WHO WORKED 30 - 34 HOURS	-0.561**	0.044	-0.162	0.226	-0.021	-0.316*	0.273*	-0.149	-0.081	-0.218
PERCENT WHO WORKED 35 - 39 HOURS	-0.150	0.163	-0.436*	-0.057	0.289*	-0.242	0.371*	-0.175	0.061	-0.283*
PERCENT WHO WORKED 40 HOURS	0.044	0.389*	0.565**	0.144	0.408*	-0.183	-0.158	-0.114	0.008	-0.015
PERCENT WHO WORKED 41 - 48 HOURS	0.607**	-0.101	0.281*	-0.119	-0.302*	0.235	0.215	0.130	0.217	-0.147
PERCENT WHO WORKED 49 - 59 HOURS	0.630**	-0.251*	0.127	-0.156	-0.431*	0.416*	0.133	0.054	0.112	-0.043
PERCENT WHO WORKED 60 - ++ HOURS	0.502**	-0.418*	-0.031	-0.111	-0.357*	0.477*	0.021	0.002	0.011	0.044
PERCENT WHO EARNED $ 0	-0.438*	-0.363*	-0.349*	-0.152	-0.062	0.201	0.103	-0.058	0.192	0.298*
PERCENT WHO EARNED $ ---- - 999	-0.843**	-0.164	-0.373*	-0.047	-0.058	0.089	-0.059	0.021	-0.015	0.089
PERCENT WHO EARNED $ 1000 - 1999	-0.836**	-0.149	-0.354*	-0.061	-0.003	0.074	-0.028	0.036	-0.013	0.081
PERCENT WHO EARNED $ 2000 - 2999	-0.860**	-0.090	-0.215	-0.035	0.079	0.061	0.154	0.088	0.123	0.020
PERCENT WHO EARNED $ 3000 - 3999	-0.823**	0.002	0.045	-0.105	0.158	0.027	0.312*	0.100	0.255*	-0.004
PERCENT WHO EARNED $ 4000 - 4999	-0.694**	0.121	0.210	-0.277*	0.272*	0.003	0.363*	0.037	0.263*	0.036
PERCENT WHO EARNED $ 5000 - 5999	-0.446*	0.239	0.413*	-0.380*	0.289*	0.123	0.400*	-0.069	0.178	0.047
PERCENT WHO EARNED $ 6000 - 6999	-0.128	0.330*	0.569**	-0.411*	0.218	0.254*	0.282*	-0.172	-0.115	0.065
PERCENT WHO EARNED $ 7000 - 7999	0.224	0.288*	0.642**	-0.277*	0.103	0.293*	0.116	-0.270*	-0.263*	0.075
PERCENT WHO EARNED $ 8000 - 9999	0.563**	0.227	0.514**	-0.110	-0.019	0.198	-0.052	-0.291*	-0.329*	0.055

TABLE A-5 CONTINUED

UNROTATED FACTOR MATRIX

OCCUPATIONAL CHARACTERISTIC	FACTOR 1	2	3	4	5	6	7	8	9	10
PERCENT WHO EARNED $10000 - 11999	0.836**	0.086	0.189	0.021	-0.071	0.079	-0.072	-0.240	-0.201	-0.007
PERCENT WHO EARNED $12000 - 14999	0.890**	0.009	-0.057	0.132	-0.092	0.053	-0.009	-0.197	-0.075	-0.020
PERCENT WHO EARNED $15000 - 24999	0.822**	-0.158	-0.278*	0.165	-0.061	0.078	0.083	-0.199	0.038	-0.035
PERCENT WHO EARNED $25000 - +++++	0.653**	-0.324*	-0.358*	0.051	-0.132	0.121	0.206	-0.162	0.169	-0.019
PERCENT MALE UNEMPLOYMENT	-0.668**	0.162	0.238	0.279*	-0.319*	-0.065	-0.099	-0.337*	0.068	0.038
PERCENT FEMALE UNEMPLOYMENT	-0.455*	0.106	0.291*	0.296*	-0.185	0.097	0.015	-0.428*	0.245	-0.212
PERCENT TOTAL UNEMPLOYMENT	-0.715**	0.192	0.259*	0.242	-0.221	-0.100	-0.019	-0.395*	0.114	-0.042
PERCENT MALE NLF	-0.745**	-0.369*	0.071	0.004	-0.009	-0.015	-0.274*	-0.152	-0.033	0.024
PERCENT FEMALE NLF	-0.546**	-0.149	-0.122	-0.032	0.047	0.015	-0.175	-0.345*	0.254*	-0.280*
PERCENT TOTAL NLF	-0.802**	-0.264*	-0.133	-0.020	0.177	-0.078	-0.142	-0.179	0.046	0.018
EIGEN VALUE	21.550	7.860	7.230	2.980	2.270	1.990	1.790	1.510	1.360	1.030
PERCENT VARIANCE	35.330	12.880	11.860	4.890	3.720	3.270	2.930	2.470	2.220	1.690

NOTE: ** IS USED TO SIGNIFY LOADINGS GREATER IN ABSOLUTE VALUE THEN .50, WHILE * IS USED TO SIGNIFY LOADINGS GREATER IN ABSOLUTE VALUE THEN .25 BUT LESS THEN .50

presents the mathematically unique unrotated factor loadings matrix (F) for the first ten factors. The factor loading f_{kj} is the product moment correlation of the kth variable with the jth factor dimension. As can be observed from Table A-5, about 56 percent of the variance of percentage white male could be explained by the first factor.

The number of independent sources of variance in the data matrix is equal to the number of factors which can be extracted from the data. The latter is equal to the rank of the matrix, or the number of variables in the case of the component model. However, the extraction of a number of factors equal to the original number of variables hardly implies a parsimonious solution. For this reason, factoring is usually stopped before all possible factors are extracted. There are a large number of decision criteria that have been suggested as to when to stop factoring. The more popular eigenvalue-one decision rule is utilized in this study. Only those factors with eigenvalues greater than unity were extracted.

The first factor extracted is capable of explaining over 35 percent of the variation in the data matrix. The pattern of factor loadings can be readily interpreted in an economic context. The factor was high positive loadings on percentage white male, percentage white female, the middle range of the age distribution, the upper range of the education distribution, percentage of workers working 50-52 weeks, the upper range of the hours distribution and the upper range of the earnings distribution. It has high negative loadings on percentage Negro male, percentage Negro female, percentage unemployed, percentage NLF, the lower range of the age distribution, the lower range of the weeks distribution and the lower range of the earnings distribution. The structure could be tagged with the label, "prime-age-white-worker." In general, occupations dominated by nonwhites, young workers, and possessing part-time, part-year characteristics with low education requirements and meager compensation would have very high factor scores on this dimension.

The second factor is capable of explaining over 12 percent of the variation in the data matrix. However, it can be given less economic meaning than the first factor. It has high positive loadings on the lower range of the age distribution and high negative loadings on the upper range of the age distribution. In general, the remaining factor loadings have low values. The best label for this factor would probably be "young-worker."

The third factor is capable of explaining over 11 percent of the variation in the data matrix. It has positive loadings on percentage Negro male, percentage Negro female, the lower range of the education distribution and the middle range of the earnings distribution. Negative loadings can be observed for the upper range of the education distribution and the lower range of the hours distribution. The highly tentative label, "unskilled black worker", could be applied to this structure.

Beyond the first three factors, loading patterns rapidly become less interpretable. Techniques of matrix rotation to an objectively determined simple structure have been developed to facilitate interpretation of basic dimensions.[24] Rotation is nothing more than the transformation of the initial factor matrix (A) into some rotated final factor matrix (B) such that,

$$B = A\ T \tag{A-17}$$

where T is some transformation matrix. It has been shown in subsection A.2.1 that A is mathematically unique. However, B is not. It is dependent on the type of rotation performed. In general, there are basically two groups of rotational procedures, orthogonal and oblique rotation. While both rotation techniques seek to approximate simple structure, oblique rotation permits the factors to be correlated, but orthogonal rotation does not. Orthogonal rotation can be treated as a special case of oblique rotation.

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[24] Simple structure is achieved by rotating the factors around the origin until each factor is "maximally colinear with a distinct cluster of vectors." See R. J. Rummel, Applied Factor Analysis, pp. 376-385.

Table A-6 presents the results of an orthogonal varimax rotation of the initial factor matrix. The varimax criterion for rotation is a function of the variance of the factor loadings. In terms of the notation of equation (A-17), the object of the varimax method of rotation is to determine the orthogonal transformation T which will carry the original factor matrix A into a new factor matrix B for which the variance of squared factor loadings is a maximum. This facilitates interpretation of factor dimensions by attempting to force the factor loadings to a value of zero or one. The transformed factor loading b_{kj} can be interpreted as the standardized regression coefficient for predicting the kth variable from the jth factor.[25]

The orthogonal factor score matrix is given in Table A-7. From subsection A.2.1, it is clear that the factor scores are described mathematically as linear combinations of the variables. The coefficients in the equation for any factor score in terms of the variables, is simply its set of factor weights. The factor score s_{ij} can be interpreted as a measure of the relationship between the ith occupation and the jth factor. Thus, the characteristics

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[25]For a more precise definition of varimax rotation, see Harry Harman, Modern Factor Analysis, pp. 304-313.

TABLE A-6

ROTATED FACTOR MATRIX

OCCUPATIONAL CHARACTERISTIC	FACTOR 1	2	3	4	5	6	7	8	9	10
PERCENT WHITE MALE	-0.393*	-0.439*	0.038	-0.650**	0.275*	-0.139	0.018	-0.039	-0.015	0.005
PERCENT BLACK MALE	0.358*	0.499*	-0.015	0.619**	-0.266*	0.163	-0.061	0.069	0.010	-0.049
PERCENT OTHER MALE	0.411*	-0.246	-0.051	0.371*	-0.065	-0.017	0.195	-0.046	0.075	0.403*
PERCENT WHITE FEMALE	-0.125	-0.245	-0.104	-0.861**	0.070	-0.040	0.041	-0.001	-0.134	-0.000
PERCENT BLACK FEMALE	0.121	0.293*	0.084	0.823**	-0.083	0.053	-0.043	0.018	0.118	-0.047
PERCENT OTHER FEMALE	0.131	-0.383*	0.124	0.324*	0.025	0.075	0.067	-0.090	0.262*	0.329*
PERCENT 16 - 17 YEAR OLDS	0.637**	0.387*	-0.195	0.070	0.024	0.136	-0.323*	-0.084	0.179	0.096
PERCENT 18 - 19 YEAR OLDS	0.495*	0.381*	-0.416*	0.060	-0.162	0.203	-0.408*	0.014	0.184	0.120
PERCENT 20 - 24 YEAR OLDS	0.315*	0.065	-0.708**	0.075	-0.197	0.317*	-0.332*	0.211	0.082	0.023
PERCENT 25 - 29 YEAR OLDS	-0.241	-0.238	-0.767**	0.079	0.073	0.132	0.135	0.273*	0.032	-0.139
PERCENT 30 - 34 YEAR OLDS	-0.360*	-0.279*	-0.442*	0.096	0.174	-0.064	0.608**	0.058	-0.018	-0.084
PERCENT 35 - 39 YEAR OLDS	-0.411*	-0.219	-0.123	0.029	0.082	-0.118	0.751**	-0.090	-0.039	-0.020
PERCENT 40 - 44 YEAR OLDS	-0.464*	-0.114	0.267*	-0.088	0.066	-0.144	0.665**	-0.092	-0.099	0.048
PERCENT 45 - 49 YEAR OLDS	-0.472*	0.004	0.543**	-0.151	-0.083	-0.107	0.481*	-0.027	0.025	0.107
PERCENT 50 - 54 YEAR OLDS	-0.332*	0.109	0.797**	-0.047	-0.061	-0.054	0.258*	0.048	0.018	0.081
PERCENT 55 - 59 YEAR OLDS	-0.163	0.175	0.903**	0.041	0.024	0.052	0.048	0.045	-0.028	-0.008
PERCENT 60 - 62 YEAR OLDS	-0.038	0.113	0.895**	0.128	0.058	0.031	-0.060	0.046	-0.012	-0.022
PERCENT 63 - 64 YEAR OLDS	0.043	-0.011	0.884**	0.128	0.132	-0.016	-0.070	0.039	-0.086	-0.053
PERCENT 65 - 69 YEAR OLDS	0.287*	-0.055	0.818**	0.085	0.215	0.014	-0.064	-0.078	0.009	-0.039
PERCENT 70 - ++ YEAR OLDS	0.342*	-0.183	0.699**	0.001	0.264*	0.043	-0.102	-0.147	0.040	-0.037
PERCENT WITH 00 - 04 YEARS OF EDUCATION	0.208	0.690**	0.276*	0.389*	0.060	0.107	-0.042	0.034	0.230	-0.046
PERCENT WITH 05 - 07 YEARS OF EDUCATION	0.156	0.732**	0.301*	0.276*	0.044	0.111	-0.006	0.040	0.218	-0.052
PERCENT WITH 8 YEARS OF EDUCATION	0.081	0.805**	0.346*	0.162	0.018	0.130	-0.004	0.082	0.159	0.020
PERCENT WITH 09 - 11 YEARS OF EDUCATION	0.268*	0.771**	0.068	-0.002	-0.032	0.053	-0.137	0.012	0.203	0.034
PERCENT WITH 12 YEARS OF EDUCATION	-0.078	0.146	-0.195	-0.337*	-0.253*	0.255*	-0.211	0.363*	-0.034	0.455*
PERCENT WITH 13 - 15 YEARS OF EDUCATION	0.023	-0.669**	-0.171	-0.292*	0.030	-0.146	-0.125	0.220	-0.004	0.340*
PERCENT WITH 16 YEARS OF EDUCATION	-0.085	-0.824**	0.050	-0.084	0.107	-0.223	0.161	-0.075	-0.027	0.088
PERCENT WITH 17 - ++ YEARS OF EDUCATION	-0.025	-0.838**	0.069	-0.041	0.158	-0.156	0.163	-0.127	-0.020	-0.026
PERCENT WHO WORKED 50 - 52 WEEKS	-0.841**	-0.267*	0.111	-0.121	0.177	0.003	0.068	-0.039	-0.127	0.269*
PERCENT WHO WORKED 40 - 49 WEEKS	0.528**	0.341*	-0.034	0.138	-0.138	0.095	0.148	0.230	0.053	-0.555**
PERCENT WHO WORKED 27 - 39 WEEKS	0.815**	0.234	-0.092	0.123	-0.180	0.037	0.016	0.090	0.156	-0.244
PERCENT WHO WORKED 14 - 26 WEEKS	0.828**	0.159	-0.219	0.098	-0.174	0.088	-0.200	-0.081	0.158	-0.037
PERCENT WHO WORKED 01 - 13 WEEKS	0.847**	0.139	-0.055	0.157	-0.139	0.069	-0.194	-0.066	0.174	0.031
PERCENT WHO WORKED 01 - 14 HOURS	0.883**	-0.093	0.120	0.036	0.018	-0.083	-0.103	-0.074	0.016	-0.056
PERCENT WHO WORKED 15 - 29 HOURS	0.892**	-0.044	-0.007	-0.016	-0.051	0.039	-0.086	-0.115	-0.006	-0.157
PERCENT WHO WORKED 30 - 34 HOURS	0.438*	0.106	-0.043	0.026	-0.300*	0.116	-0.013	-0.164	0.282*	-0.473*
PERCENT WHO WORKED 35 - 39 HOURS	0.226	-0.444*	-0.076	-0.146	-0.252*	0.360*	-0.065	-0.148	0.173	-0.337*
PERCENT WHO WORKED 40 HOURS	-0.475*	0.197	-0.192	0.212	-0.538**	0.135	0.054	0.242	0.117	0.083
PERCENT WHO WORKED 41 - 48 HOURS	-0.580**	0.019	0.050	-0.130	0.613**	0.068	0.098	0.001	-0.065	-0.045
PERCENT WHO WORKED 49 - 59 HOURS	-0.412*	-0.065	0.143	-0.144	0.800**	-0.120	0.079	0.092	-0.079	0.050
PERCENT WHO WORKED 60 - ++ HOURS	-0.183	-0.146	0.286*	-0.049	0.749**	-0.239	0.074	0.100	-0.083	0.138
PERCENT WHO EARNED $ 0	0.662**	0.007	0.250*	-0.042	0.213	0.174	0.068	-0.097	0.044	0.242
PERCENT WHO EARNED $ ---- - 999	0.872**	0.158	0.054	0.139	-0.067	0.073	-0.218	-0.158	0.087	0.065
PERCENT WHO EARNED $ 1000 - 1999	0.846**	0.145	0.056	0.148	-0.099	0.124	-0.216	-0.151	0.066	0.052
PERCENT WHO EARNED $ 2000 - 2999	0.744**	0.212	0.022	0.236	-0.104	0.363*	-0.148	-0.190	0.093	-0.028
PERCENT WHO EARNED $ 3000 - 3999	0.542**	0.337*	-0.005	0.192	-0.123	0.622**	-0.100	-0.127	0.113	-0.058
PERCENT WHO EARNED $ 4000 - 4999	0.354*	0.330*	-0.024	0.097	-0.186	0.771**	-0.111	0.058	0.076	-0.007
PERCENT WHO EARNED $ 5000 - 5999	0.093	0.296*	-0.067	0.065	-0.104	0.788**	-0.103	0.344*	0.060	0.007
PERCENT WHO EARNED $ 6000 - 6999	-0.162	0.236	-0.107	0.060	-0.027	0.523**	-0.137	0.683**	-0.016	-0.001
PERCENT WHO EARNED $ 7000 - 7999	-0.422*	0.162	-0.076	0.050	0.056	0.174	-0.050	0.795**	-0.002	0.015
PERCENT WHO EARNED $ 8000 - 9999	-0.602**	-0.003	-0.063	-0.041	0.093	-0.187	0.044	0.685**	-0.011	0.010

TABLE A-6 CONTINUED

ROTATED FACTOR MATRIX

OCCUPATIONAL CHARACTERISTIC	FACTOR 1	2	3	4	5	6	7	8	9	10
PERCENT WHO EARNED $10000 - 11999	-0.660**	-0.288*	-0.003	-0.170	0.176	-0.346*	0.166	0.361*	-0.015	-0.005
PERCENT WHO EARNED $12000 - 14999	-0.578**	-0.454*	0.002	-0.201	0.249	-0.361*	0.276*	0.136	0.002	-0.025
PERCENT WHO EARNED $15000 - 24999	-0.403*	-0.589**	0.116	-0.194	0.324*	-0.293*	0.331*	-0.030	0.048	-0.028
PERCENT WHO EARNED $25000 - +++++	-0.206	-0.529**	0.238	-0.247	0.467*	-0.135	0.307*	-0.133	0.054	-0.016
PERCENT MALE UNEMPLOYMENT	0.376*	0.566**	-0.213	0.099	-0.159	-0.087	0.029	0.074	0.532**	-0.064
PERCENT FEMALE UNEMPLOYMENT	0.117	0.363*	-0.136	0.212	-0.000	0.083	0.022	0.049	0.704**	-0.095
PERCENT TOTAL UNEMPLOYMENT	0.362*	0.533**	-0.200	0.102	-0.224	0.054	-0.001	0.083	0.604**	-0.115
PERCENT MALE NLF	0.536**	0.400*	0.340*	0.211	-0.203	-0.057	-0.229	-0.037	0.266*	0.137
PERCENT FEMALE NLF	0.358*	0.056	0.141	0.097	-0.119	0.127	-0.297*	-0.156	0.564**	0.099
PERCENT TOTAL NLF	0.650**	0.195	0.266*	0.173	-0.326*	0.134	-0.195	-0.102	0.276*	0.111
VARIANCE	13.740	8.470	7.180	3.690	3.480	3.300	3.100	2.650	2.280	1.670
PERCENT VARIANCE	27.720	17.090	14.490	7.430	7.030	6.660	6.520	5.340	4.590	1.670

NOTE: ** IS USED TO SIGNIFY LOADINGS GREATER IN ABSOLUTE VALUE THEN .50, WHILE * IS USED TO SIGNIFY LOADINGS GREATER IN ABSOLUTE VALUE THEN .25 BUT LESS THEN .50

TABLE A-7

ORTHOGONAL FACTOR SCORE MATRIX

OCCUPATION	FACTOR 1	2	3	4	5
PROFESSIONAL, TECHNICAL, AND KINDRED WORKERS					
ACCOUNTANTS	-0.224	-1.783	0.120	-0.120	0.297
ARCHITECTS	-0.437	-1.571	-0.244	1.274	1.364
COMPUTER SPECIALISTS					
COMPUTER PROGRAMMERS	-0.428	-1.987	-2.558	0.745	0.344
COMPUTER SYSTEMS ANALYSTS	-1.361	-1.723	-2.183	0.812	0.249
COMPUTER SPECIALISTS, N.E.C.	-1.511	-1.840	-2.271	1.095	0.379
ENGINEERS					
AERONAUTICAL AND ASTRONAUTICAL ENGINEERS	-2.030	-0.712	-1.091	-0.736	-1.226
CHEMICAL ENGINEERS	-1.808	-1.990	-0.859	0.549	-0.892
CIVIL ENGINEERS	-1.231	-1.524	0.001	0.711	-0.229
ELECTRICAL AND ELECTRONIC ENGINEERS	-1.703	-1.197	-1.185	0.259	-0.372
INDUSTRIAL ENGINEERS	-2.026	-0.850	-0.421	-0.839	-0.560
MECHANICAL ENGINEERS	-1.510	-0.823	-0.379	-0.223	-0.473
METALLURGICAL AND MATERIALS ENGINEERS	-1.901	-1.212	-0.395	-1.275	-1.354
MINING ENGINEERS	-0.300	-0.196	-0.178	-1.349	0.103
PETROLEUM ENGINEERS	-1.685	-0.706	-0.704	-1.359	0.244
SALES ENGINEERS	-2.066	-0.666	-0.283	-1.449	0.525
ENGINEERS, N.E.C.	-0.888	-0.962	-0.466	-0.097	-0.092
FARM MANAGEMENT ADVISORS	-1.612	-0.458	-0.449	1.085	0.651
FORESTERS AND CONSERVATIONISTS	-0.612	-0.420	-0.117	0.439	-0.104
HOME MANAGEMENT ADVISORS	0.116	-1.541	0.199	1.358	-0.689
LAWYERS AND JUDGES					
JUDGES	-1.632	-2.011	2.785	0.009	0.115
LAWYERS	-0.865	-1.568	0.309	0.180	2.132
LIBRARIANS, ARCHIVISTS, AND CURATORS					
LIBRARIANS	1.345	-2.089	0.823	0.033	-1.911
ARCHIVISTS AND CURATORS	0.588	-1.274	0.018	-0.235	0.801
MATHEMATICAL SPECIALISTS					
ACTUARIES	-0.395	-2.834	-0.763	-0.282	0.081
MATHEMATICIANS	-0.901	-2.522	-1.659	1.705	-1.093
STATISTICIANS	-0.397	-2.294	0.147	0.406	-1.207
LIFE AND PHYSICAL SCIENTISTS					
AGRICULTURAL SCIENTISTS	0.048	-0.419	0.275	-0.442	0.644
ATMOSPHERIC AND SPACE SCIENTISTS	-1.242	-0.634	0.055	-0.365	-1.233
BIOLOGICAL SCIENTISTS	-0.079	-2.145	-1.117	1.541	0.212
CHEMISTS	-1.021	-1.869	-0.507	1.264	-0.573
GEOLOGISTS	-0.907	-1.266	-0.647	-0.910	-0.153
MARINE SCIENTISTS	-1.593	-0.820	-0.986	-0.632	-1.441
PHYSICISTS AND ASTRONOMERS	-0.936	-1.720	-1.315	1.298	0.513
LIFE AND PHYSICAL SCIENTISTS, N.E.C.	-1.393	-1.426	-1.314	1.692	0.057
OPERATIONS AND SYSTEMS RESEARCHERS AND ANALYSTS	-2.109	-1.066	-0.895	-0.476	-0.916
PERSONNEL AND LABOR RELATIONS WORKERS	-0.849	-1.017	-0.116	0.023	-0.074
PHYSICIANS, AND RELATED PRACTITIONERS					
CHIROPRACTORS	0.010	-1.531	1.213	-1.292	0.691
DENTISTS	-0.436	-1.788	0.804	0.559	0.872
OPTOMETRISTS	-1.380	-1.931	1.465	-0.385	0.859
PHARMACISTS	-0.298	-1.927	0.433	1.164	2.230
PHYSICIANS, MEDICAL AND OSTEOPATHIC	-0.033	-1.461	0.305	1.605	1.947
PODIATRISTS	-0.328	-1.725	1.701	-0.210	0.560
VETERINARIANS	-0.421	-0.092	-0.703	-1.031	2.337

TABLE A-7 CONTINUED

ORTHOGONAL FACTOR SCORE MATRIX

OCCUPATION	FACTOR 1	2	3	4	5
HEALTH PRACTITIONERS, N.E.C.	1.951	-1.114	0.731	-2.482	1.353
NURSES, DIETITIANS, AND THERAPISTS					
DIETITIANS	0.589	-0.835	0.708	1.450	-1.421
REGISTERED NURSES	1.173	-1.264	0.281	0.440	-1.258
THERAPISTS	0.657	-1.450	-0.808	0.600	-0.095
HEALTH TECHNOLOGISTS AND TECHNICIANS					
CLINICAL LABORATORY TECHNOLOGISTS AND TECHNICIANS	0.595	-1.675	-1.265	1.166	-0.144
DENTAL HYGIENISTS	1.733	-2.049	-0.913	-0.674	-0.545
HEALTH RECORD TECHNOLOGISTS AND TECHNICIANS	0.519	-1.885	0.746	0.154	-1.866
RADIOLOGIC TECHNOLOGISTS AND TECHNICIANS	0.556	-1.130	-1.508	-0.051	0.364
THERAPY ASSISTANTS	0.695	-0.625	-0.217	0.934	-1.742
HEALTH TECHNOLOGISTS AND TECHNICIANS, N.E.C	0.554	-1.185	-1.029	0.991	0.173
RELIGIOUS WORKERS					
CLERGYMEN	-0.122	-1.020	0.705	1.647	2.317
RELIGIOUS WORKERS, N.E.C.	1.446	-0.944	0.825	-0.667	1.319
SOCIAL SCIENTISTS					
ECONOMISTS	-0.641	-1.707	-0.646	0.148	0.366
POLITICAL SCIENTISTS	0.077	-1.562	-0.371	-0.481	0.523
PSYCHOLOGISTS	0.467	-1.579	-0.941	0.429	0.730
SOCIOLOGISTS	-0.660	-1.786	-1.331	1.716	0.920
URBAN AND REGIONAL PLANNERS	-0.363	-2.285	-1.276	1.677	0.593
SOCIAL SCIENTISTS, N.E.C.	0.266	-2.150	0.015	0.697	-0.245
SOCIAL AND RECREATION WORKERS					
SOCIAL WORKERS	0.065	-2.035	-0.150	1.629	-0.658
RECREATION WORKERS	1.242	-1.362	-0.602	0.851	0.596
TEACHERS, COLLEGE AND UNIVERSITY	1.268	-1.758	-0.782	0.784	0.922
TEACHERS, EXCEPT COLLEGE AND UNIVERSITY					
ADULT EDUCATION TEACHERS	1.017	-1.426	-0.202	0.501	-0.004
ELEMENTARY SCHOOL TEACHERS	1.074	-2.278	0.154	1.022	-0.878
PREKINDERGARTEN AND KINDERGARTEN TEACHERS	2.425	-1.307	-0.259	0.895	-1.385
SECONDARY SCHOOL TEACHERS	0.799	-2.036	-0.772	0.929	0.184
TEACHERS, EXCEPT COLLEGE AND UNIVERSITY, N.E.C.	2.299	-1.021	0.283	-0.674	0.020
ENGINEERING AND SCIENCE TECHNICIANS					
AGRICULTURE AND BIOLOGICAL TECHNICIANS, EXCEPT HEALTH	0.427	-0.913	-0.500	0.184	0.472
CHEMICAL TECHNICIANS	-0.415	-1.294	-1.026	0.706	-0.348
DRAFTSMEN	-0.315	-1.196	-1.244	-0.293	-0.277
ELECTRICAL AND ELECTRONIC ENGINEERING TECHNICIANS	-0.736	-0.600	-1.779	0.163	-0.024
INDUSTRIAL ENGINEERING TECHNICIANS	-1.287	-0.569	-0.738	-0.294	-0.708
MECHANICAL ENGINEERING TECHNICIANS	-1.967	-0.050	-0.598	-0.692	-1.219
MATHEMATICAL TECHNICIANS	-0.555	-0.355	-2.247	-1.261	-0.937
SURVEYORS	-0.179	-0.892	-0.951	-0.246	0.520
ENGINEERING AND SCIENCE TECHNICIANS, N.E.C.	-0.064	-0.967	-1.092	0.031	-0.304
TECHNICIANS, EXCEPT HEALTH, AND ENGINEERING AND SCIENCE					
AIRPLANE PILOTS	-0.121	-0.343	-1.305	-2.736	0.155
AIR TRAFFIC CONTROLLERS	-1.700	-0.682	-1.288	0.973	-0.526
EMBALMERS	-0.248	-1.484	-0.493	1.846	2.083
FLIGHT ENGINEERS	-0.358	-0.513	-1.368	-2.360	-1.144
RADIO OPERATORS	0.197	-0.167	-0.117	-0.561	0.578
TOOL PROGRAMMERS, NUMERICAL CONTROL	-1.231	-0.482	-2.557	0.146	0.288
TECHNICIANS, N.E.C.	-0.253	-0.811	-0.624	0.400	-0.300
VOCATIONAL AND EDUCATIONAL COUNSELORS	0.912	-1.593	-0.369	1.183	0.143

TABLE A-7 CONTINUED

ORTHOGONAL FACTOR SCORE MATRIX

OCCUPATION	FACTOR 1	2	3	4	5
WRITERS, ARTISTS, AND ENTERTAINERS					
ACTORS	2.087	-1.268	-0.627	-0.639	0.543
ATHLETES AND KINDRED WORKERS	1.755	-0.676	-0.809	-0.924	1.417
AUTHORS	0.847	-1.215	0.136	-1.515	0.030
DANCERS	1.942	-1.005	-2.153	0.254	0.453
DESIGNERS	0.036	-1.363	-0.613	-0.370	0.505
EDITORS AND REPORTERS	0.398	-1.742	-0.175	-0.516	0.417
MUSICIANS AND COMPOSERS	2.314	-0.735	-0.525	-0.849	0.065
PAINTERS AND SCULPTORS	1.056	-1.280	-0.284	-1.070	0.273
PHOTOGRAPHERS	0.428	-0.734	-0.112	-1.026	0.734
PUBLIC RELATIONS MEN AND PUBLICITY WRITERS	-0.189	-1.217	0.219	-0.558	0.372
RADIO AND TELEVISION ANNOUNCERS	0.436	-1.376	-1.831	-0.481	1.474
WRITERS, ARTISTS, AND ENTERTAINERS, N.E.C.	1.045	-1.144	-0.438	-0.068	0.592
RESEARCH WORKERS, NOT SPECIFIED	0.713	-2.199	-1.122	0.996	0.511
PROFESSIONAL, TECHNICAL, AND KINDRED WORKERS --ALLOCATED	0.508	-1.429	-0.151	0.773	-0.546
MANAGERS AND ADMINISTRATORS, EXCEPT FARM					
ASSESSORS, CONTROLLERS, AND TREASURERS; LOCAL PUBLIC ADMINISTRATION	-0.202	-1.295	2.496	-1.652	-1.140
BANK OFFICERS AND FINANCIAL MANAGERS	-1.313	-1.270	0.037	-0.255	0.797
BUYERS AND SHIPPERS, FARM PRODUCTS	-0.263	0.053	1.224	-1.119	1.577
BUYERS, WHOLESALE AND RETAIL TRADE	-0.501	-0.477	0.679	-1.101	1.362
CREDIT MEN	-1.008	-1.125	0.075	-1.373	0.370
FUNERAL DIRECTORS	-0.621	-0.614	0.867	0.670	1.654
HEALTH ADMINISTRATORS	-0.561	-0.849	1.432	-0.194	0.311
CONSTRUCTION INSPECTORS, PUBLIC ADMINISTRATION	-1.586	-0.738	2.813	-1.879	-2.981
INSPECTORS, EXCEPT CONSTRUCTION, PUBLIC ADMINISTRATION	-1.601	-0.773	1.366	0.422	-1.307
MANAGERS AND SUPERINTENDENTS, BUILDING	0.632	-0.733	1.974	-0.501	0.629
OFFICE MANAGERS, N.E.C.	-0.764	-0.698	0.816	-1.965	-0.093
OFFICERS, PILOTS, AND PURSERS; SHIP	0.528	0.660	0.972	-1.820	0.706
OFFICIALS AND ADMINISTRATORS; PUBLIC ADMINISTRATION, N.E.C.	-1.195	-1.150	1.627	0.128	-1.053
OFFICIALS OF LODGES, SOCIETIES, AND UNIONS	-0.505	-0.567	1.153	-0.319	0.465
POSTMASTERS AND MAIL SUPERINTENDENTS	-1.708	-0.593	2.695	-1.590	-1.397
PURCHASING AGENTS AND BUYERS, N.E.C.	-1.767	-0.648	0.666	-0.812	-0.848
RAILROAD CONDUCTORS	-1.480	0.671	1.932	-0.179	-0.178
RESTAURANT, CAFETERIA, AND BAR MANAGERS	0.629	-0.151	0.904	-0.470	1.434
SALES MANAGERS AND DEPARTMENT HEADS, RETAIL TRADE	-0.764	-0.075	-0.343	-0.919	1.694
SALES MANAGERS, EXCEPT RETAIL TRADE	-2.094	-0.205	-0.111	-1.142	1.207
SCHOOL ADMINISTRATORS, COLLEGE	-0.596	-1.270	0.522	0.149	0.560
SCHOOL ADMINISTRATORS, ELEMENTARY AND SECONDARY	-0.305	-0.915	0.956	0.629	0.390
MANAGERS AND ADMINISTRATORS, N.E.C., SALARIED					
CONSTRUCTION	-0.855	0.336	0.731	-1.477	0.512
DURABLE GOODS MANUFACTURING	-2.233	-0.027	0.516	-1.410	0.848
NONDURABLE GOODS	-1.999	-0.397	0.865	-1.380	0.853
TRANSPORTATION	-0.910	-0.324	0.795	-1.041	0.534
COMMUNICATIONS, AND UTILITIES AND SANITARY SERVICES	-2.017	-0.419	0.897	-1.133	-0.118
WHOLESALE TRADE	-1.538	-0.334	0.781	-0.845	1.460
RETAIL TRADE	-0.793	0.080	0.008	-0.604	2.076
FINANCE, INSURANCE AND REAL ESTATE	-1.178	-1.140	0.650	-0.782	0.545
BUSINESS AND REPAIR SERVICES	-0.946	-0.583	-0.164	-0.311	1.578
PERSONAL SERVICES	0.047	-0.256	1.413	-0.734	1.264
ALL OTHER INDUSTRIES	-0.365	-0.710	0.741	-0.111	0.892
MANAGERS AND ADMINISTRATORS, N.E.C. SELF EMPLOYED					

TABLE A-7 CONTINUED

ORTHOGONAL FACTOR SCORE MATRIX

OCCUPATION	FACTOR 1	2	3	4	5
CONSTRUCTION	0.206	0.464	1.331	-1.864	0.384
DURABLE GOODS MANUFACTURING	0.104	-0.170	1.792	-1.202	1.132
NONDURABLE GOODS,	-0.209	-0.757	2.195	-1.344	1.049
TRANSPORTATION	0.348	0.471	1.564	-1.314	0.935
COMMUNICATIONS AND UTILITIES AND SANITARY SERFICES	-0.033	-0.263	1.439	0.127	1.373
WHOLESALE TRADE	-0.114	-0.558	2.023	-0.599	1.712
RETAIL TRADE	0.105	0.074	1.971	-0.888	1.710
FINANCE, INSURANCE AND REAL ESTATE	0.211	-1.096	2.594	-1.839	0.924
BUSINESS AND REPAIR SERVICES	0.061	-0.217	1.450	-0.785	1.515
PERSONAL SERVICES	0.499	-0.429	2.602	-0.667	0.993
ALL OTHER INDUSTRIES	0.918	-0.128	1.587	-1.370	1.369
MANAGERS AND ADMINISTRATORS, EXCEPT FARM-- ALLOCATED	-0.235	-0.769	0.425	0.240	-0.235
SALES WORKERS					
ADVERTISING AGENTS AND SALESMEN	-0.006	-0.963	-0.128	-1.466	0.784
AUCTIONEERS	0.077	-0.055	0.943	-1.305	1.831
DEMONSTRATORS	2.463	-0.165	-0.661	-1.577	-0.401
HUCKSTERS AND PEDDLERS	2.623	0.113	0.101	-1.875	-0.161
INSURANCE AGENTS, BROKERS, AND UNDERWRITERS	-0.515	-1.022	0.210	-0.473	0.923
NEWSBOYS	1.554	0.963	-0.431	-1.660	0.315
REAL ESTATE AGENTS AND BROKERS	0.815	-0.657	1.624	-1.828	0.646
STOCK AND BOND SALESMEN	-0.397	-1.669	0.000	-0.461	1.099
SALESMEN AND SALES CLERKS. N.E.C.					
SALES REPRESENTATIVES, MANUFACTURING INDUSTRIES	-0.648	-0.753	0.099	-1.201	1.070
SALES REPRESENTATIVES, WHOLESALE TRADE	-0.608	-0.648	0.183	-0.443	1.631
SALES CLERKS, GENERAL MERCHANDISE STORES	1.422	-0.236	0.734	-1.577	-1.678
SALES CLERKS, FOOD STORES	1.675	0.462	0.739	-1.409	0.889
SALES CLERKS, APPAREL AND ACCESSORIES STORES	1.458	-0.203	0.852	-1.525	-0.074
OTHER SALES CLERKS, RETAIL TRADE	1.288	-0.219	0.553	-1.451	1.142
SALESMEN, RETAIL TRADE	0.253	0.118	0.453	-1.463	1.937
SALESMEN OF SERVICES AND CONSTRUCTION	0.661	-0.625	0.178	-1.155	0.890
SALES WORKERS--ALLOCATED	0.561	-0.286	0.070	-0.180	-0.607
CLERICAL AND KINDRED WORKERS					
BANK TELLERS	0.334	-0.839	-0.888	-1.019	-2.294
BILLING CLERKS	0.398	-0.669	0.102	-0.877	-1.664
BOOKKEEPERS	0.874	-0.705	0.547	-1.680	-0.960
CASHIERS	1.725	0.416	-0.506	-1.076	-0.522
CLERICAL ASSISTANTS, SOCIAL WELFARE	0.678	-1.269	0.775	0.777	-1.073
CLERICAL SUPERVISORS, N.E.C.	-1.303	-0.912	0.857	-0.073	-1.651
COLLECTORS, BILL AND ACCOUNT	0.297	-0.876	-0.182	-0.342	0.818
COUNTER CLERKS, EXCEPT FOOD	1.132	-0.228	0.150	-0.695	-0.159
DISPATCHERS AND STARTERS, VEHICLE	-0.104	0.266	0.248	-0.255	0.947
ENUMERATORS AND INTERVIEWERS	2.001	-0.831	-0.222	-0.772	-0.852
ESTIMATORS AND INVESTIGATORS, N.E.C.	-0.290	-1.170	0.188	-0.586	-0.311
EXPEDITERS AND PRODUCTION CONTROLLERS	-1.008	-0.412	-0.317	-0.245	-0.503
FILE CLERKS	0.895	-0.614	-0.358	0.042	-1.810
INSURANCE ADJUSTERS, EXAMINERS, AND INVESTIGATORS	-0.875	-1.584	-0.663	0.063	0.046
LIBRARY ATTENDANTS AND ASSISTANTS	2.107	-1.241	-0.390	-0.260	-1.845
MAIL CARRIERS, POST OFFICE	-0.610	0.095	0.244	0.196	-1.078
MAIL HANDLERS, EXCEPT POST OFFICE	0.735	-0.590	0.132	0.085	-0.681
MESSENGERS AND OFFICE BOYS	1.173	-0.460	0.298	0.410	0.092
METER READERS, UTILITIES	-0.599	0.149	-0.622	0.134	-0.280

TABLE A-7 CONTINUED

ORTHOGONAL FACTOR SCORE MATRIX

OCCUPATION	FACTOR 1	2	3	4	5
OFFICE MACHINE OPERATORS					
BOOKKEEPING AND BILLING MACHINE OPERATORS	0.397	-0.909	-0.784	-0.311	-1.946
CALCULATING MACHINE OPERATORS	0.569	-0.996	0.715	-0.527	-2.458
COMPUTER AND PERIPHERAL EQUIPMENT OPERATORS	-0.189	-1.182	-2.296	0.620	0.180
DUPLICATING MACHINE OPERATORS	0.591	-0.492	-0.422	-0.177	-0.961
KEY PUNCH OPERATORS	0.206	-0.815	-1.525	0.320	-1.254
TABULATING MACHINE OPERATORS	0.153	-0.897	-1.426	1.128	-0.898
OFFICE MACHINE OPERATORS, N.E.C.	0.451	-0.361	-0.256	-0.292	-1.083
PAYROLL AND TIMEKEEPING CLERKS	-0.175	-0.449	0.418	-1.194	-1.678
POSTAL CLERKS	-0.158	-0.345	0.380	1.317	-1.522
PROOFREADERS	0.667	-1.133	0.833	-0.817	-1.365
REAL ESTATE APPRAISERS	-0.592	-1.645	1.283	-0.732	-0.220
RECEPTIONISTS	1.171	-0.545	-0.268	-1.075	-1.445
SECRETARIES	0.615	-1.162	-0.248	-1.422	-2.118
SHIPPING AND RECEIVING CLERKS	-0.354	0.143	-0.159	0.446	0.116
STATISTICAL CLERKS	0.051	-1.066	0.339	-0.447	-1.320
STENOGRAPHERS	0.053	-1.606	0.237	-1.095	-2.188
STOCK CLERKS AND STOREKEEPERS	0.184	-0.324	0.053	0.285	-0.199
TEACHER AIDES, EXC. SCHOOL MONITORS	2.723	-0.422	-1.098	0.589	-2.288
TELEGRAPH OPERATORS	-0.489	-0.208	0.313	-0.151	-0.273
TELEPHONE OPERATORS	0.444	-0.288	-0.247	-0.679	-1.986
TICKET, STATION, AND EXPRESS AGENTS	-0.332	-1.008	-0.926	0.682	0.036
TYPISTS	0.851	-0.774	-0.571	-0.420	-2.336
WEIGHERS	-0.217	0.117	0.642	0.339	-0.083
MISCELLANEOUS AND NOT SPECIFIED CLERICAL WORKERS					
MANUFACTURING	-0.020	-0.583	0.092	-1.220	-1.164
TRANSPORTATION, COMMUNICATIONS, AND OTHER PUBLIC UTILITIES	-0.066	-0.819	-0.132	-0.700	-1.133
WHOLESALE AND RETAIL TRADE	1.019	-0.293	0.139	-1.135	-0.667
FINANCE, INSURANCE, AND REAL ESTATE	0.417	-0.987	-0.125	-0.732	-1.529
PROFESSIONAL AND RELATED SERVICES	1.424	-1.014	-0.098	0.013	-1.376
PUBLIC ADMINISTRATION	-0.074	-1.011	1.061	0.145	-2.255
ALL OTHER INDUSTRIES	1.400	-0.640	0.443	-0.844	-0.348
CLERICAL AND KINDRED WORKERS --ALLOCATED	0.687	-0.608	-0.052	0.405	-1.278
CRAFTSMEN AND KINDRED WORKERS					
AUTOMOBILE ACCESSORIES INSTALLERS	0.208	0.827	-1.170	0.571	2.248
BAKERS	0.224	0.474	0.917	0.254	0.947
CABINETMAKERS	0.060	0.421	0.752	-0.353	0.713
CARPET INSTALLERS	0.407	0.933	-1.753	-1.002	1.592
CONSTRUCTION CRAFTSMEN					
BRICKMASONS AND STONEMASONS	0.617	0.694	-0.070	0.061	-0.738
BRICKMASONS AND STONEMASONS, APPRENTICES	0.316	0.343	-1.367	-1.788	-0.968
BULLDOZER OPERATORS	0.185	1.310	-0.153	0.597	1.038
CARPENTERS	0.474	0.363	0.845	-0.593	-0.430
CARPENTER APPRENTICES	1.295	1.440	-2.254	-2.738	-0.630
CEMENT AND CONCRETE FINISHERS	0.531	1.154	-0.187	1.558	-0.004
ELECTRICIANS	-0.820	0.105	-0.129	-0.358	-0.083
ELECTRICIAN APPRENTICES	-0.264	0.440	-2.160	-2.077	-0.335
EXCAVATING, GRADING, AND ROAD MACHINE OPERATORS; EXC. BULLDOZER	0.019	1.424	-0.067	-0.136	0.905
FLOOR LAYERS, EXC. TILE SETTERS	0.120	0.799	-0.128	-1.023	0.467
PAINTERS, CONSTRUCTION AND MAINTENANCE	0.831	0.378	1.006	-0.647	-0.305
PAINTER APPRENTICES	0.411	0.892	-1.311	-2.308	-1.965

TABLE A-7 CONTINUED

ORTHOGONAL FACTOR SCORE MATRIX

OCCUPATION	FACTOR 1	2	3	4	5
PAPERHANGERS	1.247	0.254	1.993	-2.278	-0.462
PLASTERERS	0.289	0.928	0.665	0.389	-1.179
PLASTERER APPRENTICES	0.007	1.203	-1.530	-1.203	-0.016
PLUMBERS AND PIPE FITTERS	-0.351	0.236	0.401	-0.149	-0.322
PLUMBER AND PIPE FITTER APPRENTICES	-0.084	0.664	-2.329	-1.836	-0.370
ROOFERS AND SLATERS	0.993	0.565	-0.797	0.769	0.378
STRUCTURAL METAL CRAFTSMEN	0.119	0.731	-0.319	-1.266	-0.572
TILE SETTERS	0.130	0.964	-0.467	-0.169	-0.152
CRANEMEN, DERRICKMEN, AND HOISTMEN	-1.027	1.562	0.157	0.591	-0.139
DECORATORS AND WINDOW DRESSERS	1.123	-0.345	0.343	-0.958	0.811
DENTAL LABORATORY TECHNICIANS	0.042	-0.593	-0.129	0.312	0.571
ELECTRIC POWER LINEMEN AND CABLEMEN	-1.390	0.858	-1.512	0.591	0.220
ENGRAVERS, EXC. PHOTOENGRAVERS	0.722	-0.036	-0.053	-0.417	0.446
FOREMEN, N.E.C.					
CONSTRUCTION	-0.743	0.600	0.399	-0.403	-0.006
MANUFACTURING; DURABLE GOODS	-2.277	0.421	0.282	-0.449	-0.174
MANUFACTURING; NONDURABLE GOODS	-1.692	0.322	0.491	-0.564	0.368
TRANSPORTATION	-1.803	0.521	1.242	-0.029	-0.184
COMMUNICATIONS, AND UTILITIES AND SANITARY SERVICES	-2.330	0.398	1.332	-0.532	-1.359
WHOLESALE AND RETAIL TRADE	-1.259	0.027	0.235	0.100	1.185
ALL OTHER INDUSTRIES	-1.023	-0.046	1.200	0.163	-0.138
FURNITURE AND WOOD FINISHERS	0.022	0.157	0.688	0.678	0.376
FURRIERS	-0.718	-0.350	2.543	-0.395	-0.679
GLAZIERS	-0.581	0.714	-0.672	0.005	0.915
INSPECTORS, SCALERS, AND GRADERS; LOG AND LUMBER	-0.307	0.736	0.528	0.848	0.507
INSPECTORS, N.E.C.	-1.244	-0.497	1.100	0.803	-0.619
JEWELERS AND WATCHMAKERS	-0.114	-0.663	1.665	-0.119	0.887
LOCOMOTIVE ENGINEERS	-1.940	0.326	2.565	-0.472	-0.432
LOCOMOTIVE FIREMEN	-0.861	0.608	-0.963	0.636	0.555
MECHANICS AND REPAIRMEN					
AIR CONDITIONING, HEATING, AND REFRIGERATION	-0.554	0.410	-0.252	-0.379	0.904
AIRCRAFT	-1.633	0.287	-0.641	0.789	-1.076
AUTOMOBILE BODY REPAIRMEN	-0.219	1.493	-1.404	0.003	2.118
AUTOMOBILE MECHANICS	-0.538	1.049	-0.719	0.525	2.052
AUTOMOBILE MECHANIC APPRENTICES	1.572	1.795	-2.509	-2.502	0.656
DATA PROCESSING MACHINE REPAIRMEN	-1.900	-0.685	-2.700	0.865	0.530
FARM IMPLEMENT	-0.007	1.329	-0.124	-0.562	2.287
HEAVY EQUIPMENT MECHANICS, INCL. DIESEL	-1.038	0.802	0.095	0.123	0.568
HOUSEHOLD APPLIANCE AND ACCESSORY INSTALLERS AND MECHANICS	-0.488	0.589	-0.209	0.146	0.619
LOOM FIXERS	-2.446	2.232	0.817	-0.220	0.408
OFFICE MACHINE	-0.831	-0.419	-1.267	0.567	-0.197
RADIO AND TELEVISION	0.089	0.126	-0.532	0.134	1.097
RAILROAD AND CAR SHOP	-1.455	1.563	1.236	-1.252	-1.615
MECHANIC, EXC. AUTO, APPRENTICES	-0.101	0.177	-2.387	-0.378	0.416
MISCELLANEOUS MECHANICS AND REPAIRMEN	-0.173	0.163	-0.108	-0.010	0.929
NOT SPECIFIED MECHANICS AND REPAIRMEN	-0.507	0.519	0.273	-0.592	0.353
METAL CRAFTSMEN, EXCEPT MECHANICS					
BLACKSMITHS	0.426	0.721	1.670	-0.322	0.656
BOILERMAKERS	-0.025	1.252	0.928	-1.980	-0.700
FORGEMEN AND HAMMERMEN	-0.961	1.380	0.063	-0.402	-0.225
HEAT TREATERS, ANNEALERS, AND TEMPERERS	-1.824	1.007	0.516	0.615	-0.385

TABLE A-7 CONTINUED

ORTHOGONAL FACTOR SCORE MATRIX

OCCUPATION	FACTOR 1	2	3	4	5
JOB AND DIE SETTERS, METAL	-1.610	0.957	0.157	-0.257	-0.457
MACHINISTS	-1.144	0.486	0.219	0.174	0.228
MACHINIST APPRENTICES	-0.138	0.785	-2.354	-1.619	0.610
MILLWRIGHTS	-1.431	1.530	0.679	-1.310	-0.856
MOLDERS, METAL	-0.773	1.356	-0.431	0.308	-0.215
MOLDER APPRENTICES	-1.579	1.585	-2.178	-1.449	0.396
PATTERN AND MODEL MAKERS, EXC. PAPER	-1.372	0.091	0.829	-0.857	-0.845
ROLLERS AND FINISHERS, METAL	-0.868	1.084	0.696	-0.660	-1.380
SHEETMETAL WORKERS AND TINSMITHS	-0.887	0.210	-0.134	-0.103	-0.797
SHEETMETAL APPRENTICES	-0.238	1.078	-2.456	-2.091	-0.823
SHIPFITTERS	-1.043	0.900	0.111	1.026	-1.049
TOOL AND DIE MAKERS	-1.469	0.408	0.289	-0.946	0.448
TOOL AND DIE MAKER APPRENTICES	-1.436	-0.046	-2.639	0.918	1.689
MILLERS; GRAIN, FLOUR, AND FEED	-0.240	2.014	0.650	-1.247	1.824
MOTION PICTURE PROJECTIONISTS	0.861	-1.058	1.324	-0.539	1.402
OPTICIANS, AND LENS GRINDERS AND POLISHERS	-0.506	-0.299	-0.070	-0.436	0.459
PIANO AND ORGAN TUNERS AND REPAIRMEN	0.314	-0.630	1.313	-0.340	0.654
POWER STATION OPERATORS	-1.944	0.445	0.618	-0.089	-1.509
PRINTING CRAFTSMEN					
BOOKBINDERS	-0.075	-0.045	0.319	-0.391	-0.837
COMPOSITORS AND TYPESETTERS	-0.201	-0.456	0.254	-0.519	0.075
PRINTING TRADES APPRENTICES, EXC. PRESSMEN	0.096	0.163	-2.154	-0.738	0.029
ELECTROTYPERS AND STEREOTYPERS	-1.137	0.546	0.758	-1.040	-0.635
PHOTOENGRAVERS AND LITHOGRAPHERS	-0.738	-0.246	-0.333	-0.934	0.079
PRESSMEN AND PLATE PRINTERS, PRINTING	-0.689	-0.217	-0.656	0.060	0.464
PRESSMAN APPRENTICES	-0.248	0.079	-2.434	-1.710	0.082
SHOE REPAIRMEN	0.133	0.967	1.599	-0.135	1.685
SIGN PAINTERS AND LETTERERS	0.491	-0.204	1.048	-0.453	0.509
STATIONARY ENGINEERS	-1.299	0.280	1.222	0.386	-0.121
STONE CUTTERS AND STONE CARVERS	0.550	0.793	0.455	-0.465	0.943
TAILORS	0.128	-0.017	1.491	0.187	0.382
TELEPHONE INSTALLERS AND REPAIRMEN	-1.306	0.234	-1.738	0.264	0.619
TELEPHONE LINEMEN AND SPLICERS	-1.098	0.825	-2.396	0.493	1.361
UPHOLSTERERS	0.144	0.704	0.561	-0.078	0.756
CRAFTSMEN AND KINDRED WORKERS, N.E.C.	0.043	0.250	-0.054	-0.353	0.330
FORMER MEMBERS OF THE ARMED FORCES	-0.670	-0.579	-1.614	0.650	0.190
CRAFTSMEN AND KINDRED WORKERS--ALLOCATED	-0.336	-0.089	0.397	1.131	-0.695
OPERATIVES, EXCEPT TRANSPORT					
ASBESTOS AND INSULATION WORKERS	-0.489	0.784	-1.001	-0.510	-0.178
ASSEMBLERS	-0.126	0.694	-0.653	-0.086	-1.031
BLASTERS AND POWDERMEN	-0.281	1.983	-0.059	-0.788	0.562
BOTTLING AND CANNING OPERATIVES	0.177	0.452	0.420	0.298	-0.374
CHAINMEN, RODMEN, AND AXMEN; SURVEYING	0.430	-0.099	-0.999	0.044	0.381
CHECKERS, EXAMINERS, AND INSPECTORS, MANUFACTURING	-0.578	0.393	0.217	-0.548	-1.226
CLOTHING IRONERS AND PRESSERS	0.402	0.827	0.704	1.900	-0.935
CUTTING OPERATIVES, N.E.C.	-0.346	0.728	0.127	0.102	-0.228
DRESSMAKERS AND SEAMSTRESSES, EXCEPT FACTORY	1.406	-0.164	2.367	-0.175	-0.986
DRILLERS, EARTH	0.020	0.724	-0.252	-0.177	1.289
DRY WALL INSTALLERS AND LATHERS	0.440	0.635	-1.503	-0.960	0.388
DYERS	-0.741	1.068	-0.445	0.847	0.840
GARAGE WORKERS AND GAS STATION ATTENDANTS	1.565	0.835	-0.999	-0.562	1.929

TABLE A-7 CONTINUED

ORTHOGONAL FACTOR SCORE MATRIX

OCCUPATION	FACTOR 1	2	3	4	5
GRADERS AND SORTERS, MANUFACTURING	0.315	0.747	0.443	0.013	-0.664
PRODUCE GRADERS AND PACKERS, EXCEPT FACTORY AND FARM	1.500	0.921	0.725	-0.397	-0.579
LAUNDRY AND DRY CLEANING OPERATIVES, N.E.C.	0.745	0.317	0.886	1.255	0.119
MEAT CUTTERS AND BUTCHERS, EXC. MANUFACTURING	-0.270	0.338	0.170	0.829	1.622
MEAT CUTTERS AND BUTCHERS, MANUFACTURING	-0.357	0.660	-0.248	1.237	0.801
MEAT WRAPPERS, RETAIL TRADE	0.533	1.932	-0.540	-1.910	-1.465
METALWORKING OPERATIVES, EXCEPT PRECISION MACHINE					
FILERS, POLISHERS, SANDERS, AND BUFFERS	-0.265	0.894	0.128	0.417	0.031
FURNACEMEN, SMELTERMEN, AND POURERS	-0.872	1.055	0.092	0.863	-0.525
HEATERS, METAL	-1.420	1.231	1.608	-1.743	-2.148
METAL PLATERS	-0.746	0.688	-0.542	0.161	0.352
PUNCH AND STAMPING PRESS OPERATIVES	-0.579	0.988	-0.350	-0.130	-0.796
RIVETERS AND FASTENERS	-0.016	1.196	-0.727	-0.387	-1.156
SOLDERERS	-0.154	0.892	-0.429	-0.487	-2.072
WELDERS AND FLAME-CUTTERS	-0.491	0.922	-0.499	0.173	0.441
MILLINERS	0.114	-0.324	2.184	-0.477	-1.485
MINE OPERATIVES, N.E.C.	-0.137	0.817	-0.247	0.136	0.966
MIXING OPERATIVES	-0.685	0.813	-0.370	1.109	0.727
OILERS AND GREASERS, EXC. AUTO	-0.510	0.979	0.487	0.472	0.067
PACKERS AND WRAPPERS, EXCEPT MEAT AND PRODUCE	0.349	0.790	-0.167	0.026	-0.934
PAINTERS, MANUFACTURED ARTICLES	-0.325	0.827	-0.484	0.587	0.238
PHOTOGRAPHIC PROCESS WORKERS	0.627	-0.421	-0.627	-0.316	-0.105
PRECISION MACHINE OPERATIVES					
DRILL PRESS OPERATIVES	-0.472	0.861	-0.025	-0.461	-0.277
GRINDING MACHINE OPERATIVES	-0.804	0.856	0.225	-0.289	-0.069
LATHE AND MILLING MACHINE OPERATIVES	-0.935	0.601	-0.133	-0.350	0.184
PRECISION MACHINE OPERATIVES, N.E.C.	-0.954	0.867	-0.250	-0.333	0.277
SAILORS AND DECKHANDS	0.931	0.979	-0.079	0.185	1.020
SAWYERS	-0.062	1.067	0.337	0.438	0.246
SEWERS AND STITCHERS	0.296	0.981	0.515	-0.254	-1.816
SHOEMAKING MACHINE OPERATIVES	-0.166	1.644	0.117	-1.454	-0.799
STATIONARY FIREMEN	-0.920	0.730	1.120	0.604	0.097
TEXTILE OPERATIVES					
CARDING, LAPPING, AND COMBING OPERATIVES	-1.325	1.837	0.255	0.753	-0.052
KNITTERS, LOOPERS, AND TOPPERS	-0.158	1.572	-0.206	-0.521	0.167
SPINNERS, TWISTERS, AND WINDERS	-0.846	1.908	-0.359	0.016	-0.121
WEAVERS	-0.861	1.749	0.261	-0.215	-0.189
TEXTILE OPERATIVES, N.E.C.	-0.229	1.523	-0.293	0.056	0.486
WINDING OPERATIVES, N.E.C.	-0.543	1.168	-0.553	-0.628	-0.643
MISCELLANEOUS AND NOT SPECIFIED OPERATIVES					
MANUFACTURING					
LUMBER AND WOOD PRODUCTS, EXCEPT FURNITURE	-0.126	0.925	-0.049	1.028	0.403
FURNITURE AND FIXTURES	-0.409	1.362	-0.304	0.628	0.228
STONE, CLAY AND GLASS PRODUCTS	-0.475	1.021	-0.268	-0.002	-0.161
PRIMARY METAL INDUSTRIES	-0.921	0.853	-0.059	0.668	-0.671
FABRICATED METAL INDUSTRIES	-0.367	1.098	-0.424	0.011	0.002
MACHINERY, EXCEPT ELECTRICAL	-0.515	0.684	-0.477	-0.106	0.266
ELECTRICAL MACHINERY, EQUIPMENT & SUPPLIES	-0.471	0.791	-0.694	-0.138	-1.117
TRANSPORTATION EQUIPMENT	-0.536	0.643	-0.483	0.425	-0.798
PROFESSIONAL AND PHOTOGRAPHIC EQUIPMENT AND WATCHES	-0.434	0.633	-0.378	-0.211	-0.724
ORDNANCE	-0.906	0.825	-0.754	0.335	-0.899

TABLE A-7 CONTINUED

ORTHOGONAL FACTOR SCORE MATRIX

OCCUPATION	FACTOR 1	2	3	4	5
MISCELLANEOUS MANUFACTURING	0.216	0.526	0.052	0.201	-0.359
DURABLE GOODS ALLOCATED	-0.310	1.144	-0.430	0.119	-0.264
FOOD AND KINDRED PRODUCTS	-0.092	0.504	0.095	0.951	0.500
TOBACCO MANUFACTURES	-0.971	0.911	0.822	0.748	-1.507
APPAREL AND OTHER FABRICATED TEXTILE PRODUCTS	0.053	1.096	0.099	-0.105	-1.208
PAPER AND ALLIED PRODUCTS	-0.846	1.032	-0.748	0.111	0.267
PRINTING, PUBLICHING AND ALLIED INDUSTRIES	0.247	0.173	-0.256	-0.653	-0.265
CHEMICALS AND ALLIED PRODUCTS	-1.104	0.524	-0.645	0.670	-0.572
PETROLEUM AND COAL PRODUCTS	-1.864	0.776	0.303	0.621	-1.610
RUBBER AND MISCELLANEOUS PLASTIC PRODUCTS	-0.411	0.757	-0.834	-0.030	-0.289
LEATHER AND LEATHER PRODUCTS	-0.061	1.403	0.320	-0.423	-0.691
NONDURABLE GOODS ALLOCATED	-0.322	1.397	-0.184	-0.144	-0.650
NOT SPECIFIED MANUFACTURING INDUSTRIES	0.017	0.608	-0.503	0.738	-0.425
CONSTRUCTION	0.326	0.815	-0.292	-0.006	0.733
RAILROADS AND RAILWAY EXPRESS SERVICE	-0.713	1.230	1.460	0.837	-1.462
TRANSPORTATION EXCEPT RAILROADS	-0.053	-0.069	-1.045	1.476	0.895
COMMUNICATIONS AND UTILITIES AND SANITARY SERVICES	-1.101	0.657	-0.011	0.765	-0.344
WHOLESALE TRADE	0.281	0.476	-0.154	1.109	0.715
RETAIL TRADE	0.836	0.754	-0.344	0.112	1.127
BUSINESS AND REPAIR SERVICES	0.666	0.458	-0.742	0.111	1.587
PUBLIC ADMINISTRATION	-0.869	-0.063	0.785	2.081	-1.332
ALL OTHER INDUSTRIES	1.083	-0.294	0.044	0.897	-0.010
OPERATIVES, EXCEPT TRANSPORT--ALLOCATED	0.204	0.091	0.350	1.462	-0.995
TRANSPORT EQUIPMENT OPERATIVES					
BOATMEN AND CANALMEN	0.820	1.039	0.525	-0.079	0.768
BUSDRIVERS	1.725	0.742	0.554	-0.492	0.040
CONDUCTORS AND MOTORMEN, URBAN RAIL TRANSIT	-1.107	0.915	0.383	1.921	-0.629
DELIVERYMEN AND ROUTEMEN	0.236	0.768	-0.729	-0.226	1.632
FORK LIFT AND TOW MOTOR OPERATIVES	-0.645	1.298	-1.050	0.790	0.580
MOTORMEN; MINE, FACTORY, LOGGING CAMP, ETC.	-1.454	2.400	0.629	0.433	-0.915
PARKING ATTENDANTS	1.162	0.250	0.036	0.700	1.567
RAILROAD BRAKEMEN	-0.706	0.724	-0.001	0.455	0.503
RAILROAD SWITCHMEN	-0.857	0.404	0.218	0.559	-0.392
TAXICAB DRIVERS AND CHAUFFEURS	0.698	0.146	0.965	0.872	0.950
TRUCK DRIVERS	-0.176	1.325	-0.465	0.361	1.447
TRANSPORT EQUIPMENT OPERATIVES--ALLOCATED	0.114	0.287	0.223	0.979	-0.632
LABORERS, EXCEPT FARM					
ANIMAL CARETAKERS, EXC. FARM	1.382	0.565	-0.367	-0.639	1.248
CARPENTERS' HELPERS	1.116	0.441	-0.403	0.752	-0.483
CONSTRUCTION LABORERS, EXC. CARPENTERS' HELPERS	0.664	0.684	-0.163	1.014	0.211
FISHERMEN AND OYSTERMEN	1.666	-0.041	0.452	0.700	1.539
FREIGHT AND MATERIAL HANDLERS	0.278	0.590	-0.639	0.925	0.487
GARBAGE COLLECTORS	-0.014	1.378	-0.449	1.772	0.817
GARDENERS AND GROUNDSKEEPERS, EXC. FARM	1.089	-0.029	0.880	1.431	0.607
LONGSHOREMEN AND STEVEDORES	0.492	0.336	0.758	2.097	-0.422
LUMBERMEN, RAFTSMEN, AND WOODCHOPPERS	1.345	1.007	-0.415	0.872	1.325
STOCKHANDLERS	1.434	0.701	-1.062	-0.424	0.162
TEAMSTERS	0.808	0.900	-0.022	-0.111	1.140
VEHICLE WASHERS AND EQUIPMENT CLEANERS	0.840	0.931	-0.739	1.045	0.855
WAREHOUSEMEN, N.E.C.	-0.061	0.219	-0.374	0.879	0.164
MISCELLANEOUS AND NOT SPECIFIED LABORERS					

TABLE A-7 CONTINUED

ORTHOGONAL FACTOR SCORE MATRIX

OCCUPATION	FACTOR 1	2	3	4	5
MANUFACTURING					
LUMBER AND WOOD PRODUCTS, EXCEPT FURNITURE	0.194	1.442	-0.086	1.303	0.394
FURNITURE AND FIXTURES	-0.064	1.558	-0.418	0.607	-0.261
STONE, CLAY AND GLASS PRODUCTS	0.086	1.100	-0.318	0.477	0.061
PRIMARY METAL INDUSTRIES	-0.600	0.811	-0.107	1.419	-1.007
FABRICATED METAL INDUSTRIES	0.306	1.052	-0.653	0.010	-0.329
MACHINERY, EXCEPT ELECTRICAL	0.036	0.624	-0.212	0.386	0.125
ELECTRICAL MACHINERY, EQUIPMENT & SUPPLIES	-0.548	0.993	-1.016	0.405	-1.134
TRANSPORTATION EQUIPMENT	-0.217	0.746	-0.625	0.933	-0.351
PROFESSIONAL AND PHOTOGRAPHIC EQUIPMENT AND WATCHES	0.463	0.866	0.067	0.310	-1.440
ORDNANCE	-0.697	1.694	-0.304	0.367	-1.027
MISCELLANEOUS MANUFACTURING	0.841	1.173	-0.090	0.248	-0.452
DURABLE GOODS ALLOCATED	0.858	1.484	0.374	2.035	-0.310
FOOD AND KINDRED PRODUCTS	0.280	0.500	-0.212	1.156	0.849
TOBACCO MANUFACTURES	-0.577	1.286	0.391	1.435	-1.265
TEXTILE MILL PRODUCTS	-0.263	2.249	-0.362	0.867	0.375
APPAREL AND OTHER FABRICATED TEXTILE PRODUCTS	0.983	1.725	-1.006	0.209	-0.974
PAPER AND ALLIED PRODUCTS	-0.193	0.857	-0.700	0.451	0.104
PRINTING, PUBLISHING AND ALLIED INDUSTRIES	0.477	0.818	-0.849	-0.231	-0.429
CHEMICALS AND ALLIED PRODUCTS	-0.097	1.121	-0.934	0.660	-0.564
PETROLEUM AND COAL PRODUCTS	0.051	1.417	-0.615	0.441	-1.446
RUBBER AND MISCELLANEOUS PLASTIC PRODUCTS	-0.079	1.029	-0.611	-0.313	0.018
LEATHER AND LEATHER PRODUCTS	-0.312	1.871	-0.326	-0.932	-0.428
NONDURABLE GOODS ALLOCATED	1.222	1.815	-0.210	0.200	-0.819
NOT SPECIFIED MANUFACTURING INDUSTRIES	0.358	1.622	-0.412	0.553	-0.570
RAILROADS AND RAILWAY EXPRESS SERVICE	-0.803	1.085	1.656	2.282	-0.599
TRANSPORTATION EXCEPT RAILROADS	0.682	0.509	-0.279	1.320	0.825
COMMUNICATIONS AND UTILITIES AND SANITARY SERVICES	-0.162	1.119	0.449	2.165	0.259
COMMUNICATIONS AND UTILITIES AND SANITARY SERVICES ALLOCATED	-0.043	2.081	-0.663	1.949	-0.807
WHOLESALE TRADE	0.627	0.565	-0.138	1.335	1.347
RETAIL TRADE	1.265	1.066	-0.395	0.434	1.112
BUSINESS AND REPAIR SERVICES	1.210	0.494	-0.260	0.602	1.327
PERSONAL SERVICES	2.231	0.424	1.250	1.029	0.235
PUBLIC ADMINISTRATION	0.102	0.685	0.918	2.373	-1.331
ALL OTHER INDUSTRIES	1.224	0.153	0.360	0.920	0.332
LABORERS, EXCEPT FARM--ALLOCATED	0.447	0.141	0.194	1.935	-0.971
FARMERS AND FARM MANAGERS					
FARMERS (OWNERS AND TENANTS)	0.351	-0.018	2.397	-0.711	1.406
FARM MANAGERS	0.258	-0.375	0.959	0.413	2.306
FARMERS AND FARM MANAGERS--ALLOCATED	-0.265	-0.664	1.065	2.228	0.234
FARM LABORERS AND FARM FOREMEN					
FARM FOREMEN	-0.113	-0.374	0.996	1.709	2.188
FARM LABORERS, WAGE WORKERS	1.097	0.269	0.205	1.945	1.854
FARM LABORERS, UNPAID FAMILY WORKERS	1.077	0.602	0.044	-0.890	1.224
FARM SERVICE LABORERS, SELF-EMPLOYED	1.371	0.066	0.798	0.460	1.312
FARM LABORERS AND FARM FOREMEN--ALLOCATED	1.080	-0.187	0.197	2.669	-0.528
SERVICE WORKERS, EXC. PRIVATE HOUSEHOLD					
CLEANING SERVICE WORKERS					
CHAMBERMAIDS AND MAIDS, EXCEPT PRIVATE HOUSEHOLD	1.121	0.813	0.839	1.881	-0.976
CLEANERS AND CHARWOMEN	0.743	0.744	1.097	1.886	-0.540
JANITORS AND SEXTONS	0.485	0.387	1.262	1.416	0.190

TABLE A-7 CONTINUED

ORTHOGONAL FACTOR SCORE MATRIX

OCCUPATION	FACTOR 1	2	3	4	5
FOOD SERVICE WORKERS					
BARTENDERS	1.093	0.258	0.893	-1.060	1.423
BUSBOYS	1.831	0.785	-1.371	0.568	-0.293
COOKS, EXCEPT PRIVATE HOUSEHOLD	1.603	0.785	0.774	0.399	0.215
DISHWASHERS	1.843	0.922	-0.332	0.337	-0.247
FOOD COUNTER AND FOUNTAIN WORKERS	2.151	1.028	-0.306	-1.038	-0.855
WAITERS	2.356	0.807	-1.013	-0.639	-0.199
FOOD SERVICE WORKERS, N.E.C., EXCEPT PRIVATE HOUSEHOLD	1.859	0.782	0.378	0.086	-0.863
HEALTH SERVICE WORKERS					
DENTAL ASSISTANTS	1.199	-0.449	-1.172	-1.099	-1.226
HEALTH AIDES, EXC. NURSING	0.819	-0.272	-0.358	0.839	-0.869
HEALTH TRAINEES	2.318	-0.141	-1.876	-0.365	-1.223
LAY MIDWIVES	0.122	0.015	0.426	2.323	-1.639
NURSING AIDES, ORDERLIES, AND ATTENDANTS	0.660	0.366	-0.173	1.137	-1.206
PRACTICAL NURSES	0.687	-0.151	0.238	1.009	-1.242
PERSONAL SERVICE WORKERS					
AIRLINE STEWARDESSES	1.076	-1.984	-1.695	0.253	-0.780
ATTENDANTS, RECREATION AND AMUSEMENT	1.937	-0.012	-0.342	-0.443	0.801
ATTENDANTS, PERSONAL SERVICE, N.E.C.	1.608	-0.582	1.000	0.655	-0.118
BAGGAGE PORTERS AND BELLHOPS	0.913	0.368	0.107	1.435	0.304
BARBERS	0.102	-0.066	0.716	1.562	2.584
BOARDING AND LODGINGHOUSE KEEPERS	0.786	-0.595	2.329	0.466	1.574
BOOTBLACKS	1.269	2.034	0.985	1.065	0.449
CHILD CARE WORKERS, EXC. PRIVATE HOUSEHOLD	1.923	0.206	0.272	0.575	0.259
ELEVATOR OPERATORS	-0.494	0.013	1.959	1.949	-0.221
HAIRDRESSERS AND COSMETOLOGISTS	1.135	0.063	-0.658	-0.871	0.385
PERSONAL SERVICE APPRENTICES	1.510	1.898	-2.212	-1.531	0.996
HOUSEKEEPERS, EXC. PRIVATE HOUSEHOLD	1.183	-0.434	1.304	0.333	-0.190
SCHOOL MONITORS	2.631	1.004	-0.752	-0.502	-2.143
USHERS, RECREATION AND AMUSEMENT	2.132	0.327	-1.198	-1.188	-1.043
WELFARE SERVICE AIDES	1.033	-0.750	0.233	2.415	-0.814
PROTECTIVE SERVICE WORKERS					
CROSSING GUARDS AND BRIDGE TENDERS	2.537	1.183	1.435	-0.615	-1.144
FIREMEN, FIRE PROTECTION	-1.642	0.662	-1.201	0.027	1.830
GUARDS AND WATCHMEN	-0.026	-0.387	1.869	0.795	0.565
MARSHALS AND CONSTABLES	-0.163	0.132	1.056	-1.449	0.560
POLICEMEN AND DETECTIVES	-0.848	0.060	-1.179	0.762	1.116
SHERIFFS AND BAILIFFS	-0.474	-0.210	0.643	-0.063	0.871
SERVICE WORKERS, EXC. PRIVATE HOUSEHOLD--ALLOCATED	0.693	-0.170	0.209	1.488	-1.353
PRIVATE HOUSEHOLD WORKERS					
CHILD CARE WORKERS, PRIVATE HOUSEHOLD	1.840	0.799	0.130	0.342	0.010
COOKS, PRIVATE HOUSEHOLD	0.694	0.605	2.098	2.608	-0.219
HOUSEKEEPERS, PRIVATE HOUSEHOLD	1.217	0.703	2.060	2.448	-0.318
LAUNDRESSES, PRIVATE HOUSEHOLD	1.789	0.764	1.893	2.093	-0.726
MAIDS AND SERVANTS, PRIVATE HOUSEHOLD	1.408	1.034	1.847	2.137	-0.968
PRIVATE HOUSEHOLD WORKERS--ALLOCATED	0.479	0.955	0.435	3.105	-1.952

TABLE A-7 CONTINUED

ORTHOGONAL FACTOR SCORE MATRIX

OCCUPATION	FACTOR 6	7	8	9	10
PROFESSIONAL, TECHNICAL, AND KINDRED WORKERS					
ACCOUNTANTS	0.161	-0.139	0.306	0.071	0.146
ARCHITECTS	-0.199	1.235	-1.126	0.387	0.352
COMPUTER SPECIALISTS					
COMPUTER PROGRAMMERS	-0.314	-0.521	0.131	-0.074	-0.329
COMPUTER SYSTEMS ANALYSTS	-0.557	0.127	-1.378	-0.186	-0.432
COMPUTER SPECIALISTS, N.E.C.	0.163	0.759	-1.655	-0.418	0.955
ENGINEERS					
AERONAUTICAL AND ASTRONAUTICAL ENGINEERS	-1.947	1.531	-2.470	1.770	1.004
CHEMICAL ENGINEERS	-1.082	0.371	-2.327	0.887	0.035
CIVIL ENGINEERS	-0.698	0.631	-0.974	0.062	0.388
ELECTRICAL AND ELECTRONIC ENGINEERS	-0.975	1.544	-1.776	0.254	0.482
INDUSTRIAL ENGINEERS	-1.773	-0.020	-1.225	0.631	-0.369
MECHANICAL ENGINEERS	-1.643	1.191	-1.458	1.102	0.037
METALLURGICAL AND MATERIALS ENGINEERS	-1.333	0.583	-2.055	1.057	-0.800
MINING ENGINEERS	-1.706	1.653	-1.208	-0.277	1.176
PETROLEUM ENGINEERS	-0.991	1.019	-2.776	0.764	0.971
SALES ENGINEERS	-0.999	0.571	-1.775	-0.740	-0.635
ENGINEERS, N.E.C.	-1.225	1.010	-0.809	-0.106	0.146
FARM MANAGEMENT ADVISORS	-1.675	0.041	-1.324	-1.714	0.201
FORESTERS AND CONSERVATIONISTS	-0.516	0.303	0.245	1.292	1.040
HOME MANAGEMENT ADVISORS	-0.534	-1.149	1.789	-1.122	-2.390
LAWYERS AND JUDGES					
JUDGES	0.212	-2.775	-2.179	0.541	-1.503
LAWYERS	-0.047	-0.168	-2.014	-1.193	-2.518
LIBRARIANS, ARCHIVISTS, AND CURATORS					
LIBRARIANS	-0.428	0.049	1.466	-0.910	-1.699
ARCHIVISTS AND CURATORS	0.137	-0.785	0.637	-1.089	-0.990
MATHEMATICAL SPECIALISTS					
ACTUARIES	0.899	-0.148	-1.007	0.390	-1.333
MATHEMATICIANS	-0.363	0.404	-1.045	-0.185	-0.949
STATISTICIANS	0.168	-0.192	0.267	0.936	-0.511
LIFE AND PHYSICAL SCIENTISTS					
AGRICULTURAL SCIENTISTS	-0.721	0.815	-0.226	-0.226	0.841
ATMOSPHERIC AND SPACE SCIENTISTS	-2.487	0.456	-1.420	-0.066	1.662
BIOLOGICAL SCIENTISTS	0.122	1.142	-0.136	-0.340	-0.131
CHEMISTS	-0.418	0.661	-0.746	0.879	0.349
GEOLOGISTS	-1.295	1.587	-1.987	0.745	-0.368
MARINE SCIENTISTS	-1.351	1.370	-1.500	-1.366	-0.241
PHYSICISTS AND ASTRONOMERS	-0.381	1.099	-2.206	-0.801	-0.555
LIFE AND PHYSICAL SCIENTISTS, N.E.C.	0.078	1.446	-0.940	-2.776	-0.352
OPERATIONS AND SYSTEMS RESEARCHERS AND ANALYSTS	-1.160	0.325	-0.745	0.676	-0.254
PERSONNEL AND LABOR RELATIONS WORKERS	0.099	0.571	-0.164	0.060	-0.106
PHYSICIANS, AND RELATED PRACTITIONERS					
CHIROPRACTORS	0.359	0.528	-1.218	-1.407	-1.975
DENTISTS	-0.012	0.816	-2.096	-0.821	-3.107
OPTOMETRISTS	0.551	-0.166	-1.878	-0.069	-1.913
PHARMACISTS	-0.328	-0.709	-0.646	0.087	-0.420
PHYSICIANS, MEDICAL AND OSTEOPATHIC	-0.248	1.705	-1.367	-2.201	-0.686
PODIATRISTS	0.024	-0.341	-0.805	-1.492	-3.080
VETERINARIANS	-0.436	1.329	-2.296	-1.619	-1.191

TABLE A-7 CONTINUED

ORTHOGONAL FACTOR SCORE MATRIX

OCCUPATION	FACTOR 6	7	8	9	10
HEALTH PRACTITIONERS, N.E.C.	0.123	0.376	-0.932	-2.802	-2.514
NURSES, DIETITIANS, AND THERAPISTS					
DIETITIANS	0.328	0.820	0.275	-0.343	0.433
REGISTERED NURSES	0.506	1.068	1.686	-1.237	0.492
THERAPISTS	0.283	-0.099	0.812	-0.742	-1.135
HEALTH TECHNOLOGISTS AND TECHNICIANS					
CLINICAL LABORATORY TECHNOLOGISTS AND TECHNICIANS	0.740	0.066	0.994	-0.813	0.813
DENTAL HYGIENISTS	0.668	0.554	1.682	-0.962	-2.115
HEALTH RECORD TECHNOLOGISTS AND TECHNICIANS	1.533	0.278	1.011	-1.701	0.879
RADIOLOGIC TECHNOLOGISTS AND TECHNICIANS	1.028	-0.449	0.912	-1.021	0.929
THERAPY ASSISTANTS	0.510	0.134	0.371	-1.530	1.290
HEALTH TECHNOLOGISTS AND TECHNICIANS, N.E.C	0.882	0.044	0.304	-0.691	0.859
RELIGIOUS WORKERS					
CLERGYMEN	1.203	0.296	0.002	-1.983	0.130
RELIGIOUS WORKERS, N.E.C.	0.103	-0.020	0.141	-1.192	-0.073
SOCIAL SCIENTISTS					
ECONOMISTS	-0.482	0.940	-0.987	0.019	-1.353
POLITICAL SCIENTISTS	-1.517	-0.015	-0.803	-1.576	-0.535
PSYCHOLOGISTS	0.190	1.944	-0.459	-1.384	-2.323
SOCIOLOGISTS	-0.446	-1.072	-1.329	-2.391	-3.171
URBAN AND REGIONAL PLANNERS	-0.044	0.891	-0.740	0.000	-0.806
SOCIAL SCIENTISTS, N.E.C.	-0.677	0.183	0.227	1.034	-0.501
SOCIAL AND RECREATION WORKERS					
SOCIAL WORKERS	0.424	-0.329	1.009	-0.391	-1.070
RECREATION WORKERS	-1.178	-1.641	0.690	1.738	0.627
TEACHERS, COLLEGE AND UNIVERSITY	-0.672	1.629	0.406	-1.318	-1.956
TEACHERS, EXCEPT COLLEGE AND UNIVERSITY					
ADULT EDUCATION TEACHERS	-0.537	1.101	1.205	0.087	-0.889
ELEMENTARY SCHOOL TEACHERS	-0.119	-0.101	2.090	-1.227	-3.618
PREKINDERGARTEN AND KINDERGARTEN TEACHERS	-0.894	2.240	1.259	-1.221	-0.769
SECONDARY SCHOOL TEACHERS	-0.230	0.360	1.689	-1.303	-4.005
TEACHERS, EXCEPT COLLEGE AND UNIVERSITY, N.E.C.	-0.916	0.674	1.149	-1.461	-1.237
ENGINEERING AND SCIENCE TECHNICIANS					
AGRICULTURE AND BIOLOGICAL TECHNICIANS, EXCEPT HEALTH	0.592	0.059	1.026	0.497	1.108
CHEMICAL TECHNICIANS	-0.200	-0.317	0.914	0.407	0.817
DRAFTSMEN	-0.159	-0.365	0.879	0.675	0.740
ELECTRICAL AND ELECTRONIC ENGINEERING TECHNICIANS	-0.679	0.632	0.774	-0.075	0.810
INDUSTRIAL ENGINEERING TECHNICIANS	-0.647	-0.118	0.821	0.455	0.325
MECHANICAL ENGINEERING TECHNICIANS	-1.258	0.534	-0.090	0.711	-0.110
MATHEMATICAL TECHNICIANS	-2.420	1.262	0.585	1.336	1.898
SURVEYORS	0.209	-0.345	0.713	2.102	1.249
ENGINEERING AND SCIENCE TECHNICIANS, N.E.C.	-0.368	-0.077	1.005	0.332	0.881
TECHNICIANS, EXCEPT HEALTH, AND ENGINEERING AND SCIENCE					
AIRPLANE PILOTS	-1.546	2.294	-0.789	0.043	-0.988
AIR TRAFFIC CONTROLLERS	-1.146	1.234	-0.993	0.010	2.791
EMBALMERS	0.168	-1.612	0.728	0.649	-0.753
FLIGHT ENGINEERS	-2.221	2.009	-0.164	-0.282	-1.234
RADIO OPERATORS	0.556	0.136	0.369	-0.376	1.203
TOOL PROGRAMMERS, NUMERICAL CONTROL	-2.159	-0.783	-0.408	0.501	-0.078
TECHNICIANS, N.E.C.	-0.178	0.582	0.988	0.064	1.371
VOCATIONAL AND EDUCATIONAL COUNSELORS	-1.036	1.063	0.890	-1.600	-2.490

TABLE A-7 CONTINUED

ORTHOGONAL FACTOR SCORE MATRIX

OCCUPATION	FACTOR 6	7	8	9	10
WRITERS, ARTISTS, AND ENTERTAINERS					
ACTORS	-0.985	1.311	1.489	3.066	-0.413
ATHLETES AND KINOREO WORKERS	-0.844	-0.353	0.610	1.444	0.311
AUTHORS	-0.505	1.650	0.224	0.726	-0.659
DANCERS	-0.428	-0.166	0.604	2.818	0.300
OESIGNERS	-0.088	0.931	0.080	1.148	0.372
EDITORS AND REPORTERS	-0.085	-0.054	0.290	0.513	-0.728
MUSICIANS AND COMPOSERS	-1.378	0.141	0.963	0.115	-1.028
PAINTERS ANO SCULPTORS	0.094	1.158	0.696	0.701	0.286
PHOTOGRAPHERS	0.133	0.435	0.546	0.673	0.619
PUBLIC RELATIONS MEN ANO PUBLICITY WRITERS	-0.096	0.477	-0.163	0.676	-0.365
RADIO AND TELEVISION ANNOUNCERS	-0.040	-1.042	0.138	0.654	-0.153
WRITERS, ARTISTS, ANO ENTERTAINERS, N.E.C.	-0.480	1.179	0.533	1.298	0.418
RESEARCH WORKERS, NOT SPECIFIEO	0.089	0.405	-0.104	0.659	0.237
PROFESSIONAL, TECHNICAL, ANO KINOREO WORKERS --ALLOCATED	-0.475	-0.045	0.802	0.950	-0.430
MANAGERS ANO AOMINISTRATORS, EXCEPT FARM					
ASSESSORS, CONTROLLERS, ANO TREASURERS; LOCAL PUBLIC AOMINISTRATION	0.694	-1.596	0.583	0.286	-0.061
BANK OFFICERS ANO FINANCIAL MANAGERS	0.791	-0.312	-0.902	-0.486	0.346
BUYERS AND SHIPPERS, FARM PROOUCTS	0.191	-0.615	-0.140	-0.134	0.478
BUYERS, WHOLESALE ANO RETAIL TRAOE	0.774	-0.128	-0.060	0.203	0.623
CREDIT MEN	0.785	-0.825	0.303	0.287	-0.229
FUNERAL OIRECTORS	-0.160	-1.066	0.021	-1.339	0.771
HEALTH ADMINISTRATORS	0.270	0.393	-0.200	-0.918	0.534
CONSTRUCTION INSPECTORS, PUBLIC ADMINISTRATION	-1.504	-1.684	1.322	0.007	0.172
INSPECTORS, EXCEPT CONSTRUCTION, PUBLIC AOMINISTRATION	-0.684	-0.462	0.330	1.001	1.140
MANAGERS AND SUPERINTENOENTS, BUILOING	0.197	-0.710	0.332	-0.314	0.240
OFFICE MANAGERS, N.E.C.	0.807	0.787	0.336	-0.157	0.987
OFFICERS, PILOTS, ANO PURSERS; SHIP	-1.466	1.401	0.898	0.042	-0.328
OFFICIALS AND ADMINISTRATORS; PUBLIC AOMINISTRATION, N.E.C.	-0.357	-0.326	-0.326	0.195	1.270
OFFICIALS OF LODGES, SOCIETIES, ANO UNIONS	-0.710	-0.149	-0.025	0.055	0.280
POSTMASTERS AND MAIL SUPERINTENOENTS	-0.974	-2.191	0.357	-0.628	1.592
PURCHASING AGENTS ANO BUYERS, N.E.C.	-0.336	-0.205	-0.249	0.215	0.313
RAILROAD CONDUCTORS	-3.011	-1.977	0.582	-0.845	-0.533
RESTAURANT, CAFETERIA, ANO BAR MANAGERS	0.446	1.067	0.332	0.001	1.280
SALES MANAGERS AND OEPARTMENT HEAOS, RETAIL TRAOE	0.945	0.351	-0.238	-0.276	1.067
SALES MANAGERS, EXCEPT RETAIL TRAOE	-0.899	0.713	-2.138	0.142	0.891
SCHOOL ADMINISTRATORS, COLLEGE	-0.389	0.441	-0.834	-0.285	-0.772
SCHOOL ADMINISTRATORS, ELEMENTARY ANO SECONOARY	-1.223	1.137	-0.771	-2.162	-2.703
MANAGERS ANO AOMINISTRATORS, N.E.C., SALARIED					
CONSTRUCTION	-0.863	1.408	-0.683	-0.040	0.766
DURABLE GOODS MANUFACTURING	-1.063	0.359	-2.253	0.664	0.422
NONOURABLE GOODS	-0.125	-0.224	-1.824	0.648	0.370
TRANSPORTATION	-0.434	0.534	-0.348	-0.071	1.161
COMMUNICATIONS, ANO UTILITIES ANO SANITARY SERVICES	0.043	-0.098	-1.397	-0.237	0.694
WHOLESALE TRAOE	-0.027	-0.221	-1.201	-0.109	1.289
RETAIL TRADE	0.345	-0.017	-0.112	-0.380	1.119
FINANCE, INSURANCE AND REAL ESTATE	0.404	0.082	-1.028	-0.258	-0.581
BUSINESS AND REPAIR SERVICES	0.159	0.756	-0.918	0.351	0.415
PERSONAL SERVICES	0.274	-0.172	0.150	0.331	0.718
ALL OTHER INOUSTRIES	-0.096	0.239	-0.408	0.030	-0.292
MANAGERS ANO AOMINISTRATORS, N.E.C. SELF EMPLOYED					

TABLE A-7 CONTINUED

ORTHOGONAL FACTOR SCORE MATRIX

OCCUPATION	FACTOR 6	7	8	9	10
CONSTRUCTION	-0.334	2.022	0.179	-0.248	-0.561
DURABLE GOODS MANUFACTURING	0.147	0.906	-0.103	-0.075	0.543
NONDURABLE GOODS,	0.410	-0.070	-0.285	0.234	0.943
TRANSPORTATION	-0.392	1.237	0.277	-1.743	0.356
COMMUNICATIONS AND UTILITIES AND SANITARY SERFICES	-0.557	0.682	-0.002	-1.987	0.690
WHOLESALE TRADE	0.193	0.103	-0.032	-0.033	0.946
RETAIL TRADE	0.528	0.326	-0.056	-1.058	2.007
FINANCE, INSURANCE AND REAL ESTATE	0.242	-0.405	-0.759	-0.610	-0.496
BUSINESS AND REPAIR SERVICES	0.370	1.108	-0.236	-1.406	0.713
PERSONAL SERVICES	0.264	-0.095	0.104	-0.346	1.977
ALL OTHER INDUSTRIES	-0.112	0.880	0.214	-0.642	0.686
MANAGERS AND ADMINISTRATORS, EXCEPT FARM— ALLOCATED	-0.080	0.118	0.174	1.266	-0.292
SALES WORKERS					
ADVERTISING AGENTS AND SALESMEN	0.141	0.315	-0.080	0.896	-0.627
AUCTIONEERS	-0.312	-0.346	-0.204	0.601	-0.352
DEMONSTRATORS	-1.037	1.373	-0.203	0.142	1.159
HUCKSTERS AND PEDDLERS	-1.398	1.321	-0.136	-0.496	0.715
INSURANCE AGENTS, BROKERS, AND UNDERWRITERS	0.439	0.137	-0.034	-0.203	-0.439
NEWSBOYS	-2.713	-2.027	-1.331	-0.564	0.670
REAL ESTATE AGENTS AND BROKERS	0.012	0.427	0.368	-0.336	-0.244
STOCK AND BOND SALESMEN	0.190	0.010	-0.679	0.635	-1.369
SALESMEN AND SALES CLERKS. N.E.C.					
SALES REPRESENTATIVES, MANUFACTURING INDUSTRIES	-0.140	0.044	-0.416	1.167	-0.117
SALES REPRESENTATIVES, WHOLESALE TRADE	0.241	-0.114	-0.033	0.577	0.254
SALES CLERKS, GENERAL MERCHANDISE STORES	-0.004	-0.618	-1.042	0.499	0.019
SALES CLERKS, FOOD STORES	-0.196	-0.302	-0.294	0.163	0.964
SALES CLERKS, APPAREL AND ACCESSORIES STORES	0.168	-1.112	-0.579	0.315	-0.474
OTHER SALES CLERKS, RETAIL TRADE	0.331	-0.569	-0.122	0.552	0.513
SALESMEN, RETAIL TRADE	0.219	-0.210	0.424	0.368	0.718
SALESMEN OF SERVICES AND CONSTRUCTION	-0.170	-0.083	0.042	1.408	0.343
SALES WORKERS--ALLOCATED	-0.411	-0.442	-0.240	1.257	-0.095
CLERICAL AND KINDRED WORKERS					
BANK TELLERS	2.362	0.151	-1.098	-0.962	0.532
BILLING CLERKS	2.330	-0.353	-0.126	-0.646	1.337
BOOKKEEPERS	2.025	0.972	0.348	-0.361	1.326
CASHIERS	0.092	-0.133	-1.104	-0.006	0.921
CLERICAL ASSISTANTS, SOCIAL WELFARE	1.493	-0.069	0.305	-0.474	1.942
CLERICAL SUPERVISORS, N.E.C.	0.278	0.290	0.213	-0.403	1.374
COLLECTORS, BILL AND ACCOUNT	1.213	-1.138	0.619	0.002	-0.374
COUNTER CLERKS, EXCEPT FOOD	0.629	-0.558	-0.199	0.103	0.364
DISPATCHERS AND STARTERS, VEHICLE	-0.143	0.311	0.987	-0.374	1.011
ENUMERATORS AND INTERVIEWERS	-0.678	1.153	0.148	0.728	0.681
ESTIMATORS AND INVESTIGATORS, N.E.C.	0.610	-0.375	0.098	0.479	0.200
EXPEDITERS AND PRODUCTION CONTROLLERS	0.308	0.074	0.837	0.393	0.321
FILE CLERKS	0.755	-1.084	-0.486	0.287	0.963
INSURANCE ADJUSTERS, EXAMINERS, AND INVESTIGATORS	0.875	-0.359	0.277	-0.227	-0.587
LIBRARY ATTENDANTS AND ASSISTANTS	-1.036	-1.345	0.216	-1.475	0.305
MAIL CARRIERS, POST OFFICE	-0.609	0.702	1.185	-0.966	1.236
MAIL HANDLERS, EXCEPT POST OFFICE	0.516	-1.690	0.105	0.201	0.297
MESSENGERS AND OFFICE BOYS	-0.425	-3.033	-0.390	1.102	-0.121
METER READERS, UTILITIES	0.779	-0.749	1.471	-1.127	0.723

TABLE A-7 CONTINUED

ORTHOGONAL FACTOR SCORE MATRIX

OCCUPATION	FACTOR 6	7	8	9	10
OFFICE MACHINE OPERATORS					
BOOKKEEPING AND BILLING MACHINE OPERATORS	2.298	0.187	-0.633	-0.216	1.036
CALCULATING MACHINE OPERATORS	2.076	0.112	0.294	0.128	1.075
COMPUTER AND PERIPHERAL EQUIPMENT OPERATORS	1.012	-0.792	0.906	-1.027	0.466
DUPLICATING MACHINE OPERATORS	1.296	-0.751	0.051	-0.243	0.279
KEY PUNCH OPERATORS	2.287	-0.176	-0.108	-0.435	0.700
TABULATING MACHINE OPERATORS	1.767	-0.270	0.598	-0.829	1.997
OFFICE MACHINE OPERATORS, N.E.C.	1.173	-0.830	-0.385	0.143	0.173
PAYROLL AND TIMEKEEPING CLERKS	1.448	-0.181	0.737	-0.247	0.644
POSTAL CLERKS	-0.895	0.217	1.823	-0.917	1.306
PROOFREADERS	0.886	-0.854	0.355	0.218	-0.173
REAL ESTATE APPRAISERS	-0.263	-0.030	-0.096	0.968	0.044
RECEPTIONISTS	1.394	-0.493	-0.737	-0.282	0.609
SECRETARIES	2.372	-0.023	0.336	-0.560	0.561
SHIPPING AND RECEIVING CLERKS	0.939	-0.631	0.690	-0.121	0.082
STATISTICAL CLERKS	1.542	-0.343	0.636	-0.053	0.289
STENOGRAPHERS	2.332	-0.765	0.646	-0.142	0.893
STOCK CLERKS AND STOREKEEPERS	0.585	-0.825	0.717	0.611	0.672
TEACHER AIDES, EXC. SCHOOL MONITORS	-1.019	2.700	-1.320	-1.186	0.948
TELEGRAPH OPERATORS	-0.367	-0.743	1.210	0.239	0.946
TELEPHONE OPERATORS	1.835	-0.559	-0.494	-0.648	0.733
TICKET, STATION, AND EXPRESS AGENTS	0.043	-0.455	2.049	-0.168	0.995
TYPISTS	1.551	-0.438	-0.392	-0.331	1.224
WEIGHERS	0.366	-0.495	0.683	1.190	-0.300
MISCELLANEOUS AND NOT SPECIFIED CLERICAL WORKERS					
MANUFACTURING	1.277	0.015	0.303	0.334	0.473
TRANSPORTATION, COMMUNICATIONS, AND OTHER PUBLIC UTILITIES	1.799	-0.234	1.052	-0.230	1.133
WHOLESALE AND RETAIL TRADE	1.070	-0.088	-0.619	0.208	0.735
FINANCE, INSURANCE, AND REAL ESTATE	2.245	-0.715	-0.165	-0.151	0.617
PROFESSIONAL AND RELATED SERVICES	0.467	-0.259	0.029	-0.606	0.853
PUBLIC ADMINISTRATION	1.031	-0.157	0.852	-0.124	1.238
ALL OTHER INDUSTRIES	0.591	0.169	0.066	0.729	1.049
CLERICAL AND KINDRED WORKERS --ALLOCATED	0.329	-0.203	0.188	0.803	0.248
CRAFTSMEN AND KINDRED WORKERS					
AUTOMOBILE ACCESSORIES INSTALLERS	0.447	0.478	0.777	-0.267	-0.170
BAKERS	0.762	0.255	0.216	-0.086	0.595
CABINETMAKERS	0.592	0.191	0.952	0.349	-0.024
CARPET INSTALLERS	0.267	0.652	0.606	-0.372	-0.931
CONSTRUCTION CRAFTSMEN					
BRICKMASONS AND STONEMASONS	-0.919	2.075	1.397	0.349	-2.158
BRICKMASONS AND STONEMASONS, APPRENTICES	-0.120	-1.493	1.243	-1.255	-2.262
BULLDOZER OPERATORS	-0.114	2.005	0.870	0.432	-0.508
CARPENTERS	-0.343	0.964	1.488	0.932	-1.291
CARPENTER APPRENTICES	-0.433	-1.047	1.277	0.210	-1.030
CEMENT AND CONCRETE FINISHERS	-0.796	2.505	1.427	0.532	-2.157
ELECTRICIANS	-0.550	0.366	0.616	0.445	-0.258
ELECTRICIAN APPRENTICES	0.390	-2.293	1.088	-0.984	-0.324
EXCAVATING, GRADING, AND ROAD MACHINE OPERATORS; EXC. BULLDOZER	-0.348	2.212	1.235	0.512	-0.540
FLOOR LAYERS, EXC. TILE SETTERS	0.097	1.248	0.519	1.387	-1.081
PAINTERS, CONSTPUCTION AND MAINTENANCE	-0.236	0.729	1.299	1.301	-1.316
PAINTER APPRENTICES	-0.512	-2.967	0.456	0.527	-1.498

TABLE A-7 CONTINUED

ORTHOGONAL FACTOR SCORE MATRIX

OCCUPATION	FACTOR 6	7	8	9	10
PAPERHANGERS	-0.366	0.235	1.383	-0.228	-2.010
PLASTERERS	-0.979	1.599	1.129	-0.321	-1.924
PLASTERER APPRENTICES	0.342	-2.759	-0.087	-1.901	-0.389
PLUMBERS AND PIPE FITTERS	-0.508	0.852	0.931	-0.048	-0.198
PLUMBER AND PIPE FITTER APPRENTICES	0.493	-1.856	1.012	-1.210	-0.269
ROOFERS AND SLATERS	-0.287	1.697	1.013	0.270	-1.684
STRUCTURAL METAL CRAFTSMEN	-1.344	1.584	1.435	0.474	-1.643
TILE SETTERS	-0.494	1.616	0.548	0.198	-1.268
CRANEMEN, DERRICKMEN, AND HOISTMEN	-1.255	0.883	1.128	-0.024	-0.677
DECORATORS AND WINDOW DRESSERS	0.839	0.341	0.180	0.047	0.607
DENTAL LABORATORY TECHNICIANS	0.779	0.360	0.357	-0.022	1.488
ELECTRIC POWER LINEMEN AND CABLEMEN	-0.932	0.632	0.235	-1.043	1.020
ENGRAVERS, EXC. PHOTOENGRAVERS	0.213	0.253	0.604	0.664	1.333
FOREMEN, N.E.C.					
CONSTRUCTION	-0.909	1.949	0.454	0.394	0.123
MANUFACTURING: DURABLE GOODS	-0.901	0.271	-0.678	0.254	0.508
MANUFACTURING: NONDURABLE GOODS	0.348	0.378	-0.350	0.018	0.380
TRANSPORTATION	-1.676	-0.103	0.908	-0.327	1.669
COMMUNICATIONS, AND UTILITIES AND SANITARY SERVICES	-1.572	-0.296	-0.847	-1.401	1.540
WHOLESALE AND RETAIL TRADE	0.576	0.312	0.090	-0.208	1.027
ALL OTHER INDUSTRIES	-0.269	0.647	0.419	0.022	1.251
FURNITURE AND WOOD FINISHERS	0.927	0.067	0.083	0.365	-0.306
FURRIERS	-0.233	-1.964	1.261	2.503	-3.490
GLAZIERS	0.085	0.722	0.186	-0.203	-0.064
INSPECTORS, SCALERS, AND GRADERS: LOG AND LUMBER	0.547	0.281	0.591	0.180	-0.030
INSPECTORS, N.E.C.	-0.461	-1.022	1.276	0.953	0.046
JEWELERS AND WATCHMAKERS	0.833	-0.463	0.700	1.200	0.653
LOCOMOTIVE ENGINEERS	-2.667	-2.134	-0.096	0.186	-0.361
LOCOMOTIVE FIREMEN	-2.116	-0.916	1.161	-1.421	-0.948
MECHANICS AND REPAIRMEN					
AIR CONDITIONING, HEATING, AND REFRIGERATION	-0.087	0.545	0.545	0.200	0.498
AIRCRAFT	-1.286	0.705	0.869	0.827	1.746
AUTOMOBILE BODY REPAIRMEN	0.334	0.767	0.128	-1.756	0.468
AUTOMOBILE MECHANICS	0.555	0.015	0.029	-0.884	1.182
AUTOMOBILE MECHANIC APPRENTICES	-0.595	-1.555	-0.426	-2.462	0.621
DATA PROCESSING MACHINE REPAIRMEN	-0.554	-0.878	-0.253	-0.760	0.006
FARM IMPLEMENT	0.968	-0.058	0.559	-2.020	0.771
HEAVY EQUIPMENT MECHANICS, INCL. DIESEL	-0.141	0.174	0.645	-0.505	0.248
HOUSEHOLD APPLIANCE AND ACCESSORY INSTALLERS AND MECHANICS	0.144	0.463	0.799	-0.926	0.431
LOOM FIXERS	1.266	-0.819	-0.263	-1.459	-1.261
OFFICE MACHINE	0.393	-0.220	1.344	-1.213	0.887
RADIO AND TELEVISION	0.284	0.997	0.768	-0.285	1.490
RAILROAD AND CAR SHOP	-0.758	-0.559	1.335	-1.647	0.959
MECHANIC, EXC. AUTO, APPRENTICES	-0.285	-1.866	1.399	-1.120	0.064
MISCELLANEOUS MECHANICS AND REPAIRMEN	0.010	0.025	0.918	0.297	0.656
NOT SPECIFIED MECHANICS AND REPAIRMEN	0.072	0.465	0.770	-0.385	0.366
METAL CRAFTSMEN, EXCEPT MECHANICS					
BLACKSMITHS	-0.476	-0.319	1.664	-1.188	-0.004
BOILERMAKERS	-1.366	0.918	1.692	-1.150	-0.917
FORGEMEN AND HAMMERMEN	-0.707	-0.067	0.597	-0.237	-1.217
HEAT TREATERS, ANNEALERS, AND TEMPERERS	-1.020	-1.351	0.956	0.875	-0.678

TABLE A-7 CONTINUED

ORTHOGONAL FACTOR SCORE MATRIX

OCCUPATION	FACTOR 6	7	8	9	10
JOB AND DIE SETTERS, METAL	-0.602	0.326	0.919	0.139	-0.541
MACHINISTS	-0.534	-0.661	1.147	0.244	0.023
MACHINIST APPRENTICES	1.000	-2.110	0.813	-1.316	0.209
MILLWRIGHTS	-2.260	0.245	0.957	-0.494	-0.669
MOLDERS, METAL	0.347	0.923	0.279	-0.113	-0.494
MOLDER APPRENTICES	1.426	-2.274	-0.558	-0.984	-0.554
PATTERN AND MODEL MAKERS, EXC. PAPER	-1.094	-0.223	0.142	1.119	-0.331
ROLLERS AND FINISHERS, METAL	-0.834	0.826	0.611	-0.065	-0.410
SHEETMETAL WORKERS AND TINSMITHS	-0.474	0.420	0.982	1.140	-0.424
SHEETMETAL APPRENTICES	0.771	-2.132	1.335	-2.458	-0.939
SHIPFITTERS	-1.152	-0.247	1.545	-1.077	0.184
TOOL AND DIE MAKERS	-1.102	-0.877	0.206	0.792	-0.661
TOOL AND DIE MAKER APPRENTICES	0.149	-4.049	0.473	-1.243	-1.289
MILLERS; GRAIN, FLOUR, AND FEED	1.042	-0.047	-0.223	-2.182	0.705
MOTION PICTURE PROJECTIONISTS	-0.640	-2.850	0.804	1.782	-1.082
OPTICIANS, AND LENS GRINDERS AND POLISHERS	0.788	-0.333	0.124	0.315	0.475
PIANO AND ORGAN TUNERS AND REPAIRMEN	-0.027	-1.369	0.345	0.399	-1.992
POWER STATION OPERATORS	-1.547	-0.161	0.599	-0.743	1.768
PRINTING CRAFTSMEN					
BOOKBINDERS	1.245	0.099	-0.426	0.817	-0.689
COMPOSITORS AND TYPESETTERS	0.450	-0.436	0.573	0.048	-0.267
PRINTING TRADES APPRENTICES, EXC. PRESSMEN	0.662	-2.944	-0.150	0.517	-0.156
ELECTROTYPERS AND STEREOTYPERS	-0.985	-0.146	-0.111	-0.569	-0.446
PHOTOENGRAVERS AND LITHOGRAPHERS	-0.082	0.172	-0.261	0.214	-0.688
PRESSMEN AND PLATE PRINTERS, PRINTING	0.421	-0.267	0.214	0.373	-0.520
PRESSMAN APPRENTICES	0.455	-2.208	0.405	-0.035	-0.738
SHOE REPAIRMEN	1.275	-0.541	-0.410	0.158	-0.411
SIGN PAINTERS AND LETTERERS	-0.037	-0.730	0.755	0.608	0.015
STATIONARY ENGINEERS	-0.793	-0.725	0.828	-0.461	0.879
STONE CUTTERS AND STONE CARVERS	0.817	1.220	0.863	-0.133	0.177
TAILORS	0.972	-0.163	0.291	0.813	-0.719
TELEPHONE INSTALLERS AND REPAIRMEN	0.030	-0.100	-0.078	-1.587	1.806
TELEPHONE LINEMEN AND SPLICERS	0.092	-0.612	0.282	-1.790	1.093
UPHOLSTERERS	1.077	0.538	0.371	-0.212	-0.432
CRAFTSMEN AND KINDRED WORKERS, N.E.C.	-0.030	-0.249	0.814	0.644	-0.265
FORMER MEMBERS OF THE ARMED FORCES	0.134	-2.499	-1.513	3.695	1.148
CRAFTSMEN AND KINDRED WORKERS--ALLOCATED	-0.427	-0.021	0.479	1.029	-0.263
OPERATIVES, EXCEPT TRANSPORT					
ASBESTOS AND INSULATION WORKERS	-1.039	1.027	0.435	1.372	-0.929
ASSEMBLERS	0.831	0.556	0.245	0.397	-0.325
BLASTERS AND POWDERMEN	-0.461	0.607	1.239	0.842	-0.265
BOTTLING AND CANNING OPERATIVES	0.374	0.137	-0.130	2.843	0.815
CHAINMEN, RODMEN, AND AXMEN; SURVEYING	-0.001	-1.697	0.524	2.006	-0.461
CHECKERS, EXAMINERS, AND INSPECTORS, MANUFACTURING	0.946	0.591	0.252	0.542	-0.406
CLOTHING IRONERS AND PRESSERS	1.176	1.696	-1.549	0.213	-0.423
CUTTING OPERATIVES, N.E.C.	0.789	0.092	0.119	0.833	-0.611
DRESSMAKERS AND SEAMSTRESSES, EXCEPT FACTORY	0.799	0.184	-1.203	0.098	-0.089
DRILLERS, EARTH	0.056	1.042	0.829	1.279	-0.487
DRY WALL INSTALLERS AND LATHERS	-0.331	1.566	0.692	0.992	-1.689
DYERS	1.581	-0.419	-0.509	-0.361	-0.114
GARAGE WORKERS AND GAS STATION ATTENDANTS	-0.668	-1.591	-0.616	0.269	0.470

TABLE A-7 CONTINUED

ORTHOGONAL FACTOR SCORE MATRIX

OCCUPATION	FACTOR 6	7	8	9	10
GRADERS AND SORTERS, MANUFACTURING	0.680	0.515	-1.039	2.410	-0.197
PRODUCE GRADERS AND PACKERS, EXCEPT FACTORY AND FARM	-0.672	0.878	-1.147	2.706	-0.272
LAUNDRY AND DRY CLEANING OPERATIVES, N.E.C.	1.035	0.616	-1.195	0.417	0.942
MEAT CUTTERS AND BUTCHERS, EXC. MANUFACTURING	0.144	-0.452	0.714	-0.062	1.196
MEAT CUTTERS AND BUTCHERS, MANUFACTURING	0.560	0.515	-0.147	0.716	-0.345
MEAT WRAPPERS, RETAIL TRADE	2.176	2.403	-1.871	-1.076	0.357
METALWORKING OPERATIVES, EXCEPT PRECISION MACHINE					
FILERS, POLISHERS, SANDERS, AND BUFFERS	0.518	0.047	0.220	0.854	-0.829
FURNACEMEN, SMELTERMEN, AND POURERS	-0.726	0.143	1.481	-0.190	-0.582
HEATERS, METAL	-1.519	-0.517	0.890	0.704	-0.233
METAL PLATERS	0.459	-0.138	0.765	0.558	-0.286
PUNCH AND STAMPING PRESS OPERATIVES	0.585	0.630	0.465	0.966	-0.919
RIVETERS AND FASTENERS	0.403	0.598	-0.217	1.417	-0.707
SOLDERERS	1.802	1.928	-0.804	1.323	-0.051
WELDERS AND FLAME-CUTTERS	0.013	0.722	0.938	0.441	-0.151
MILLINERS	1.648	-1.536	-2.017	1.321	-2.171
MINE OPERATIVES, N.E.C.	-0.111	0.562	1.101	0.826	0.532
MIXING OPERATIVES	0.590	-0.094	0.956	0.122	-0.019
OILERS AND GREASERS, EXC. AUTO	-0.393	0.097	1.253	0.607	-0.296
PACKERS AND WRAPPERS, EXCEPT MEAT AND PRODUCE	0.895	0.496	-0.802	0.959	-0.045
PAINTERS, MANUFACTURED ARTICLES	0.559	0.349	0.431	0.717	-0.416
PHOTOGRAPHIC PROCESS WORKERS	0.669	0.398	0.134	1.112	0.786
PRECISION MACHINE OPERATIVES					
DRILL PRESS OPERATIVES	0.445	-0.346	0.958	0.761	-0.846
GRINDING MACHINE OPERATIVES	-0.225	-0.166	0.835	0.348	-0.902
LATHE AND MILLING MACHINE OPERATIVES	-0.295	-0.574	1.484	0.430	-0.659
PRECISION MACHINE OPERATIVES, N.E.C.	-0.104	-0.366	0.469	0.445	-1.066
SAILORS AND DECKHANDS	-0.969	1.160	1.457	1.341	0.065
SAWYERS	1.151	0.647	-0.171	0.457	-0.848
SEWERS AND STITCHERS	1.845	1.202	-2.460	0.426	-1.183
SHOEMAKING MACHINE OPERATIVES	2.045	0.366	-2.129	0.210	-1.284
STATIONARY FIREMEN	-0.045	-0.433	0.768	-0.046	0.485
TEXTILE OPERATIVES					
CARDING, LAPPING, AND COMBING OPERATIVES	2.177	-0.312	-2.109	-1.077	-1.371
KNITTERS, LOOPERS, AND TOPPERS	1.981	0.882	-1.348	0.543	-1.245
SPINNERS, TWISTERS, AND WINDERS	2.457	0.352	-2.469	-0.524	-1.146
WEAVERS	2.469	0.471	-1.238	-0.936	-0.610
TEXTILE OPERATIVES, N.E.C.	2.275	0.537	-1.671	-0.305	-0.548
WINDING OPERATIVES, N.E.C.	1.340	0.588	-0.304	0.055	-0.243
MISCELLANEOUS AND NOT SPECIFIED OPERATIVES					
MANUFACTURING					
LUMBER AND WOOD PRODUCTS, EXCEPT FURNITURE	0.892	0.176	-0.254	0.552	-0.630
FURNITURE AND FIXTURES	1.660	0.412	-0.904	0.154	-0.706
STONE, CLAY AND GLASS PRODUCTS	0.653	0.612	0.450	0.249	-0.247
PRIMARY METAL INDUSTRIES	-0.111	0.168	1.170	0.344	-0.276
FABRICATED METAL INDUSTRIES	0.897	0.447	0.265	0.339	-0.348
MACHINERY, EXCEPT ELECTRICAL	0.291	-0.170	0.815	0.288	-0.180
ELECTRICAL MACHINERY, EQUIPMENT & SUPPLIES	1.222	0.707	-0.179	-0.115	-0.262
TRANSPORTATION EQUIPMENT	-0.412	0.365	1.444	0.862	-0.925
PROFESSIONAL AND PHOTOGRAPHIC EQUIPMENT AND WATCHES	1.335	0.562	-0.153	0.004	0.273
ORDNANCE	0.938	0.768	0.983	1.443	0.034

TABLE A-7 CONTINUED

ORTHOGONAL FACTOR SCORE MATRIX

OCCUPATION	FACTOR 6	7	8	9	10
MISCELLANEOUS MANUFACTURING	1.198	0.478	-0.776	1.123	-0.222
DURABLE GOODS ALLOCATED	0.753	0.372	0.445	-0.740	-0.301
FOOD AND KINDRED PRODUCTS	0.620	0.181	-0.266	2.180	0.226
TOBACCO MANUFACTURES	2.296	-0.428	-0.895	0.883	-2.687
APPAREL AND OTHER FABRICATED TEXTILE PRODUCTS	1.493	0.833	-2.194	0.451	-1.443
PAPER AND ALLIED PRODUCTS	0.709	-0.079	0.002	-0.042	-0.246
PRINTING, PUBLICHING AND ALLIED INDUSTRIES	0.807	-0.500	-0.228	0.428	-0.497
CHEMICALS AND ALLIED PRODUCTS	-0.221	-0.108	0.915	-0.094	0.373
PETROLEUM AND COAL PRODUCTS	-1.701	-0.341	0.775	0.008	1.124
RUBBER AND MISCELLANEOUS PLASTIC PRODUCTS	0.728	0.187	-0.172	0.782	-0.392
LEATHER AND LEATHER PRODUCTS	1.750	0.660	-1.367	0.531	-0.913
NONDURABLE GOODS ALLOCATED	0.721	0.152	-0.732	0.231	-1.245
NOT SPECIFIED MANUFACTURING INDUSTRIES	0.813	0.469	-0.230	0.700	-0.319
CONSTRUCTION	-0.013	0.538	0.792	0.902	-0.997
RAILROADS AND RAILWAY EXPRESS SERVICE	0.013	0.008	1.731	-1.275	0.544
TRANSPORTATION EXCEPT RAILROADS	-0.439	-0.374	0.935	1.240	1.350
COMMUNICATIONS AND UTILITIES AND SANITARY SERVICES	0.007	-0.507	0.933	-0.842	1.418
WHOLESALE TRADE	0.500	0.334	0.013	1.199	-0.048
RETAIL TRADE	0.352	-0.560	-0.613	0.763	0.484
BUSINESS AND REPAIR SERVICES	0.755	0.253	0.081	0.556	0.819
PUBLIC ADMINISTRATION	0.193	0.352	1.534	0.523	2.020
ALL OTHER INDUSTRIES	-0.068	-0.265	0.007	0.688	0.252
OPERATIVES, EXCEPT TRANSPORT--ALLOCATED	0.093	0.024	-0.003	0.813	-0.201
TRANSPORT EQUIPMENT OPERATIVES					
BOATMEN AND CANALMEN	-1.085	0.296	1.330	-0.060	0.150
BUSDRIVERS	-0.698	1.737	1.210	-2.516	-0.610
CONDUCTORS AND MOTORMEN, URBAN RAIL TRANSIT	-1.552	0.311	1.421	-1.823	0.168
DELIVERYMEN AND ROUTEMEN	-0.097	-0.312	0.255	-0.104	0.495
FORK LIFT AND TOW MOTOR OPERATIVES	0.604	0.414	1.156	-0.365	-0.378
MOTORMEN: MINE, FACTORY, LOGGING CAMP, ETC.	-0.943	0.617	1.224	-0.386	-0.735
PARKING ATTENDANTS	-0.185	-1.758	-0.204	0.338	-0.288
RAILROAD BRAKEMEN	-1.636	-0.264	1.582	-1.026	-0.719
RAILROAD SWITCHMEN	-1.213	-0.237	1.411	-0.892	0.971
TAXICAB DRIVERS AND CHAUFFEURS	0.659	0.178	0.865	-0.468	-0.474
TRUCK DRIVERS	0.070	1.520	0.453	-0.053	0.165
TRANSPORT EQUIPMENT OPERATIVES--ALLOCATED	-0.117	0.376	0.635	-0.022	-0.315
LABORERS, EXCEPT FARM					
ANIMAL CARETAKERS, EXC. FARM	-0.171	-0.817	-0.226	-0.224	0.474
CARPENTERS' HELPERS	-0.155	-0.063	0.090	1.857	-0.618
CONSTRUCTION LABORERS, EXC. CARPENTERS' HELPERS	-0.189	0.622	0.751	1.452	-0.678
FISHERMEN AND OYSTERMEN	-0.162	1.319	0.580	2.339	0.670
FREIGHT AND MATERIAL HANDLERS	-0.067	-0.401	0.493	0.728	-0.058
GARBAGE COLLECTORS	0.560	0.956	-0.506	-1.045	-0.490
GARDENERS AND GROUNDSKEEPERS, EXC. FARM	-0.400	-0.844	0.284	1.254	0.805
LONGSHOREMEN AND STEVEDORES	-1.055	1.287	1.595	0.012	-1.351
LUMBERMEN, RAFTSMEN, AND WOODCHOPPERS	-0.111	1.907	0.138	1.430	-0.975
STOCKHANDLERS	-1.226	-1.914	-0.739	0.082	0.293
TEAMSTERS	0.257	1.000	0.470	1.569	-1.481
VEHICLE WASHERS AND EQUIPMENT CLEANERS	-0.654	-1.174	-0.438	0.680	0.211
WAREHOUSEMEN, N.E.C.	0.564	-0.108	1.541	0.005	1.063
MISCELLANEOUS AND NOT SPECIFIED LABORERS					

TABLE A-7 CONTINUED

ORTHOGONAL FACTOR SCORE MATRIX

OCCUPATION	FACTOR 6	7	8	9	10
MANUFACTURING					
LUMBER AND WOOD PRODUCTS, EXCEPT FURNITURE	0.507	-0.293	-0.733	0.132	-0.983
FURNITURE AND FIXTURES	1.035	-0.646	-1.689	-0.113	-0.995
STONE, CLAY AND GLASS PRODUCTS	0.962	-0.092	0.529	0.546	0.059
PRIMARY METAL INDUSTRIES	-0.224	-0.386	1.623	0.188	-0.432
FABRICATED METAL INDUSTRIES	0.498	0.013	0.220	0.454	0.300
MACHINERY, EXCEPT ELECTRICAL	0.429	-1.124	0.893	0.054	-0.235
ELECTRICAL MACHINERY, EQUIPMENT & SUPPLIES	0.866	-0.578	-0.448	0.441	0.050
TRANSPORTATION EQUIPMENT	0.055	-0.557	0.945	1.009	-0.871
PROFESSIONAL AND PHOTOGRAPHIC EQUIPMENT AND WATCHES	0.409	-0.560	-0.396	-1.466	1.840
ORDNANCE	0.725	0.713	0.440	0.836	-0.336
MISCELLANEOUS MANUFACTURING	0.107	0.199	-0.501	0.694	0.493
DURABLE GOODS ALLOCATED	-0.833	-0.631	0.890	-2.260	-0.327
FOOD AND KINDRED PRODUCTS	0.503	-0.325	-0.259	2.229	0.207
TOBACCO MANUFACTURES	0.963	-0.437	-1.639	2.311	-2.631
TEXTILE MILL PRODUCTS	1.456	-0.713	-2.608	-1.177	-0.785
APPAREL AND OTHER FABRICATED TEXTILE PRODUCTS	0.144	0.937	-1.996	-0.136	1.106
PAPER AND ALLIED PRODUCTS	0.587	-1.219	0.812	0.622	-0.060
PRINTING, PUBLICHING AND ALLIED INDUSTRIES	-1.209	-2.889	-0.937	0.870	-1.413
CHEMICALS AND ALLIED PRODUCTS	0.429	-0.408	0.923	-0.416	0.066
PETROLEUM AND COAL PRODUCTS	-0.551	-0.482	1.045	-1.676	1.009
RUBBER AND MISCELLANEOUS PLASTIC PRODUCTS	0.382	-0.785	0.034	0.574	-0.378
LEATHER AND LEATHER PRODUCTS	0.967	-0.823	-1.308	1.193	-2.295
NONDURABLE GOODS ALLOCATED	0.090	0.867	-1.352	0.523	0.167
NOT SPECIFIED MANUFACTURING INDUSTRIES	0.096	-0.092	-0.757	0.543	-0.338
RAILROADS AND RAILWAY EXPRESS SERVICE	0.593	-0.778	1.007	-0.068	1.613
TRANSPORTATION EXCEPT RAILROADS	-0.455	-0.175	0.487	0.715	0.491
COMMUNICATIONS AND UTILITIES AND SANITARY SERVICES	0.304	-0.305	0.441	-1.401	0.419
COMMUNICATIONS AND UTILITIES AND SANITARY SERVICES ALLOCATED	-0.493	0.404	-1.777	0.793	-0.352
WHOLESALE TRADE	0.035	-0.475	-0.390	1.302	0.263
RETAIL TRADE	-0.861	-1.687	-0.888	0.341	0.415
BUSINESS AND REPAIR SERVICES	-0.402	-0.095	-0.059	1.581	-0.005
PERSONAL SERVICES	-1.882	-0.820	-0.296	1.053	-0.074
PUBLIC ADMINISTRATION	0.029	-0.263	0.381	0.199	1.197
ALL OTHER INDUSTRIES	-0.610	-0.945	-0.048	0.896	0.289
LABORERS, EXCEPT FARM--ALLOCATED	-0.471	-0.324	0.039	0.757	0.036
FARMERS AND FARM MANAGERS					
FARMERS (OWNERS AND TENANTS)	0.621	-0.726	-0.488	-1.052	0.828
FARM MANAGERS	0.873	0.379	-0.390	-0.420	2.375
FARMERS AND FARM MANAGERS--ALLOCATED	0.282	-0.694	-0.871	1.002	0.632
FARM LABORERS AND FARM FOREMEN					
FARM FOREMEN	1.208	0.264	0.064	1.338	2.022
FARM LABORERS, WAGE WORKERS	-0.351	-0.970	-1.195	2.193	0.572
FARM LABORERS, UNPAID FAMILY WORKERS	-0.707	-1.698	-2.225	-0.082	1.457
FARM SERVICE LABORERS, SELF-EMPLOYED	0.150	1.854	0.657	1.344	1.728
FARM LABORERS AND FARM FOREMEN--ALLOCATED	-0.719	-0.667	-1.029	1.242	0.418
SERVICE WORKERS, EXC. PRIVATE HOUSEHOLD					
CLEANING SERVICE WORKERS					
CHAMBERMAIDS AND MAIDS, EXCEPT PRIVATE HOUSEHOLD	-0.348	0.565	-2.329	0.169	0.234
CLEANERS AND CHARWOMEN	0.189	-0.079	-1.159	-0.651	-0.223
JANITORS AND SEXTONS	0.184	-1.125	0.228	-0.571	0.304

TABLE A-7 CONTINUED

ORTHOGONAL FACTOR SCORE MATRIX

OCCUPATION	FACTOR 6	7	8	9	10
FOOD SERVICE WORDERS					
BARTENDERS	1.127	1.387	0.700	0.169	0.556
BUSBOYS	-3.168	-2.358	-2.456	0.836	0.881
COOKS, EXCEPT PRIVATE HOUSEHOLD	-0.210	0.744	-0.506	-0.143	0.444
DISHWASHERS	-2.020	-1.605	-2.143	0.871	0.732
FOOD COUNTER AND FOUNTAIN WORKERS	-1.706	-0.847	-1.915	-0.245	0.342
WAITERS	-0.627	0.911	-1.791	0.214	1.236
FOOD SERVICE WORKERS, N.E.C., EXCEPT PRIVATE HOUSEHOLD	-0.597	0.250	-1.593	-0.422	0.265
HEALTH SERVICE WORKERS					
DENTAL ASSISTANTS	1.978	-0.043	-1.883	-0.482	0.830
HEALTH AIDES, EXC. NURSING	1.169	-0.180	-1.019	-0.881	0.925
HEALTH TRAINEES	-2.356	-2.021	-1.524	-2.018	1.108
LAY MIDWIVES	-0.215	-2.246	-0.564	-2.330	-1.517
NURSING AIDES, ORDERLIES, AND ATTENDANTS	0.840	0.021	-1.432	-0.988	0.969
PRACTICAL NURSES	1.925	0.839	-0.014	-1.743	1.018
PERSONAL SERVICE WORKERS					
AIRLINE STEWARDESSES	0.406	-1.497	2.195	-0.754	-0.798
ATTENDANTS, RECREATION AND AMUSEMENT	-1.894	-1.830	-0.045	2.128	0.904
ATTENDANTS, PERSONAL SERVICE, N.E.C.	-0.157	-0.734	0.220	0.799	0.432
BAGGAGE PORTERS AND BELLHOPS	0.175	-0.900	-0.151	-1.232	0.180
BARBERS	1.799	0.019	0.324	-1.291	0.600
BOARDING AND LODGINGHOUSE KEEPERS	0.151	-2.200	-0.596	-1.049	1.220
BOOTBLACKS	-1.428	-1.673	-2.102	-2.589	-0.463
CHILD CARE WORKERS, EXC. PRIVATE HOUSEHOLD	-0.738	-0.292	-1.057	-0.899	0.747
ELEVATOR OPERATORS	1.614	-1.560	-0.360	0.549	-0.760
HAIRDRESSERS AND COSMETOLOGISTS	1.340	0.394	-0.754	-0.985	-0.143
PERSONAL SERVICE APPRENTICES	-0.175	-0.969	-1.521	-1.007	-0.297
HOUSEKEEPERS, EXC. PRIVATE HOUSEHOLD	0.396	-0.018	0.344	-0.569	0.532
SCHOOL MONITORS	-2.781	2.979	-1.245	-2.125	2.593
USHERS, RECREATION AND AMUSEMENT	-3.378	-2.394	-1.978	0.640	0.510
WELFARE SERVICE AIDES	0.786	1.381	-0.432	-1.196	0.305
PROTECTIVE SERVICE WORKERS					
CROSSING GUARDS AND BRIDGE TENDERS	-2.296	1.592	0.385	-3.220	-0.344
FIREMEN, FIRE PROTECTION	-0.619	1.152	0.020	-0.722	2.570
GUARDS AND WATCHMEN	0.534	-1.556	0.829	-0.631	-0.196
MARSHALS AND CONSTABLES	0.004	-0.581	0.448	-1.693	-0.636
POLICEMEN AND DETECTIVES	-0.544	0.507	0.699	-1.118	1.248
SHERIFFS AND BAILIFFS	0.549	-0.121	1.385	-0.142	0.920
SERVICE WORKERS, EXC. PRIVATE HOUSEHOLD—ALLOCATED	-0.256	-0.156	-0.502	0.847	0.203
PRIVATE HOUSEHOLD WORKERS					
CHILD CARE WORKERS, PRIVATE HOUSEHOLD	-3.052	-1.944	-1.559	0.079	0.369
COOKS, PRIVATE HOUSEHOLD	-0.532	-1.008	-2.274	-0.957	-0.513
HOUSEKEEPERS, PRIVATE HOUSEHOLD	-1.393	-0.896	-1.979	-1.241	-0.534
LAUNDRESSES, PRIVATE HOUSEHOLD	-2.865	-0.794	-1.576	-0.835	0.791
MAIDS AND SERVANTS, PRIVATE HOUSEHOLD	-1.924	-0.243	-1.917	-1.395	-0.983
PRIVATE HOUSEHOLD WORKERS--ALLOCATED	-1.555	0.378	-2.411	-0.785	-0.187

of the occupation dentists can be largely defined by the nature of factors 10, 8 and 2. It can also be observed that the occupation actor can be better defined by the nature of factor 1 than dentists.

Each of the ten factor dimensions will be briefly discussed in the remainder of this subsection. The content of each dimension is given a label which attempts to capture the basic character of the dimension. The dimension which is the most important for youth will, of course, be given the greatest attention. It would be inappropriate to concentrate all our attention on only that factor which is important to youth and ignore the remaining nine factors. Since each factor is uncorrelated with the other factors, they can be interpreted as separate and unique ways of classifying occupations. Each separate classification system should be examined in order to understand the characteristics of any one classification system.

Factor 1: The Peripheral Worker

The first factor derives its name from the great importance the hours worked per week and the weeks worked per year distributions play in determining its character. It has high positive loadings on the lower range of both the hours worked distirbution and the weeks worked distribution and high negative loadings on the upper range of both the hours worked distribution and the percentage of workers who worked 50-52 weeks. The peripherality of the dimension is also reflected in the importance of the stock of former workers in determining the structure's character. It has high positive loadings on male NLF and total NLF and intermediate positive loadings on female NLF.

Age also plays an important role in the first factor. The first factor exhibits positive loadings on the extreme upper and lower range of the age distribution and negative loadings on the middle range of the age distribution. Given the importance of low hours and weeks worked, it is not surprising to find high positive loadings on the lower range of the earnings distribution and high negative loadings on the upper range of the earnings distribution.

The value of the loadings on the remaining variables are as to be expected for a peripheral dimension. The first factor has positive loadings on percentage Negro males, percentage other males and the percentage unemployed. Negative loadings are also observed on percentage white males. It is important to note that education plays virtually no role in this dimension.

The existence of this dimension, coupled with its ability to explain a high percentage of the variance in the original data, underscores the recent interest shown in the peripheral worker. When viewed in the context of the factor model, it is inappropriate to speak of the bifurcation of the labor market into a full-time, full-year segment and a peripheral segment.[26] However, the extreme importance of this dimension indicates that the peripheral worker has become an important element in labor market segmentation.

The fact that 16-17 and 18-19 year olds are the dominating age group in the peripheral segment of the labor market is reassuring. It effectively means that a unique segment of the labor market in which young age plays an integral role has been identified. The factor scores can be used to establish the relationship between the dimension of peripherality and the occupations themselves. The occupation sales engineer has a factor score on the first factor of -2.07, which means that sales engineer has few of the characteristics defined by factor one. On the other hand, waiter, with a factor score of 2.35, has many of the characteristics defined by the first factor. Thus, those occupations with a factor score greater than zero can be considered to possess some of the characteristics defined by factor one. If an occupation has a factor score greater than zero on the first factor, it can be

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[26] See Dean Morse, The Peripheral Worker (New York: Columbia University Press, 1969).

considered a member of the peripheral worker segment of the labor market.

A cursory examination of Table A-7 reveals that all the occupations included in the set of youth favorable occupations are peripheral occupations. Moreover, the set of peripheral worker occupations can account for over ninety percent of all youth employed. In a sense, then, the peripheral segment of the labor market is the relevant labor market for youth.[27] The factor weights can be used to determine whom youth compete with for jobs in the peripheral segment of the labor market. Black males, other males, 20-24 year olds and workers over 65 appear to be the workers with whom youth must compete.

Factor 2: Human Capital

Sometimes it is more fruitful to examine a factor dimension in terms of its negative loadings rather than its

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[27]A labor market can be defined as including those jobs for which a single wage rate previals in equilibrium. It is that area in which the single wage prevails. However, it can also be defined as the set of occupations in which a given group of workers are able and willing to move. Of these two definitions, it is the second that I am relying on. Since only ten percent of all youth are employed outside of the peripheral segment of the labor market, it can be considered as the relevant labor market for youth. See Clark Kerr, "Labor Markets: Their Character and Consequences," Industrial Relations Research Association, Proceedings of Second Annual Meeting (Madison: n.p., 1950), pp. 69-84.

positive loadings. If a factor loading vector and its corresponding factor score vector are multiplied through by -1, it does not disturb the model. Thus, this factor dimension gets its name from the high negative loadings.

The most interesting characteristic of the second factor dimension is the pattern and magnitude of the educational variables and the earnings variables. The loadings are highly positive for the first four education variables with twelve years of education serving as the twist variable in the education distribution. High negative loadings are evident on all higher education categories. It is important to note that the earnings range three thousand dollars to seven thousand dollars exhibits positive weights in the intermediate range, while the range over ten thousand dollars shows high negative loadings. It appears that the twist variable is in the eight to ten thousand dollar range. High positive loadings are also evident on the unemployment variables and male NLF. Positive loadings in the intermediate range are observed for the extreme lower range of the age distribution, the mid-range of the weeks worked distribution, percentage Negro males and percentage Negro females. Negative loadings in the intermediate range are observed for percentage white males and percentage other females.

The apparent lack of importance of the weeks worked distribution and the hours worked distribution is highly important. The dimension is almost totally concerned with the relationship between levels of education and levels of earning. The positive loadings on the 16-17 and 18-19 year old age groups indicate that youth tend to be employed in occupations which do not allow them to realize returns to their education.

Factor 3: The Senior Worker

This factor dimension is very straightforward in interpretation. It has very high positive loadings on all age groups over forty-five years old. The age variable 40-44 years old exhibits a positive loading in the intermediate range. The remaining age variables have negative loadings with the two twenty year old categories possessing the larger magnitudes. The 35-39 years of age variable could be designated as the twist variable.

It is important to note that none of the remaining variables weigh heavily on this dimension, although positive loadings in the intermediate range can be observed for the lower range of the educational distribution and the NLF variables. Other variable distributions such as sex-color, weeks worked, hours worked, earnings and unemployment have little influence over the character of this dimension. Occupations will score high on this dimension almost solely on the basis of their respective age distribution variance and skew patterns.

Three types of occupations appear to score high on this dimension. 1. Occupations that require a long period of training in another occupation score high on this dimension. Thus, judges, which draws its members from lawyers, scores very high on this dimension. 2. Occupations that are declining, such as blacksmiths, score very high. 3. Occupations which require little training and light physical work, such as cooks in private households, score very high.

Factor 4: The Nonwhite Worker

This dimension is very straightforward, as witnessed by the high positive loadings on the nonwhite sex-color variables and the very high negative loadings on the white sex-color variables. The only other group of variables with high or intermediate loadings is the education group. The extreme lower range of the education group has positive loadings, while 12 and 13-15 years of education have negative loadings. Otherwise, this dimension is null with respect to the age, weeks worked, hours worked and earnings distributions and the percentage unemployment and NLF groups.

It appears that nonwhite workers are effectively delegated to a rather unique segment of the occupational structure of the labor market. However, they are not penalized for being nonwhite. The dimension does not exhibit large negative loadings on the upper range of the earnings distribution nor large positive loadings on unemployment. While not being penalized, they are effectively segregated to a unique segment of the occupational structure. Occupations which score high on this dimension include computer programmers, home management advisors and embalmers.

Factor 5: Long Hours

This dimension has very large positive loadings on the last three variables of the upper range of the hours worked group and negative loadings on the lower range of the hours worked group (except the last). Percentage white male and the extreme upper range of the earnings group exhibit positive loadings.

It has long been recognized by labor economists that the character of some occupations dictates long hours. This is especially true of occupations such as lawyers and pharmacists.

Factor 6: Mid-Remunerative

Large positive loadings are observed for this dimension on the mid-range of the earnings variables distribution. The highest loadings are on the four thousand dollar interval. The variables percentage 20-24 years old, percentage with twelve years of education and percentage working 35-39 hours,play a minor positive role. Low negative loadings are observed for the extreme upper range of the earnings group.

Occupations that have high factor scores for this dimension are ones that provide very limited opportunities for advancement within the occupation. They include such occupations as bookkeepers, cashiers, secretaries and keypunch operators.

Factor 7: Prime Age Workers

This dimension is very straighforward in its interpretation, as can be observed by the high positive loadings on the mid-range of the age distribution and the negative loadings on the lower range. The percent of 20-29 year olds appears to be the twist variable between the lower range and the mid-range. The twist variable between the mid-range and the upper range of the age distribution appears to be the percent of 55-59 year olds. Positive loadings are exhibited on the extreme upper range of the earnings structure and negative loadings are observed on the percent NLF.

It is surprising that this dimension is so far down the line. One would expect that prime age would play a more important role in labor market segmentation. Occupations having high factor scores on this dimension include airplane pilots and flight engineers.

Factor 8: Screening

The dominating characteristic of this dimension is the positive loading on twelve years of education and the strong positive loadings on the mid-range of the earnings distribution. The dimension is basically null with respect to all other variables. The lack of variables in the education set, other than twelve years of education, loading high on this dimension seems to point to a variant of the screening hypothesis. Occupations that score high on this dimension should be ones that require a high school certificate as a prerequisite to entrance. Occupations that have high factor scores on this dimension include airline stewardesses and dental hygienists.

It should be noted that this dimension is uncorrelated with the "human capital" dimension. While it is important not to read too much meaning into the results of the model, it appears that the screening hypothesis and the human capital hypothesis are not mutually exclusive. It has long been recognized by labor economists that when testing either hypothesis, the failure to control for occupational differences will have a great impact on the results.

The model presented here suggests one possible means of identifying occupations which may satisfy the conditions of the screening hypothesis.

Factor 9: Labor Reserve

Percentage unemployed and percentage NLF, especially with respect to females, are the principal determinates of this dimension. Positive loadings are observed for percentage other females and percentage who worked 30-34 hours. The sparsity of high loadings on other variables makes this dimension especially difficult to interpret. Occupations that have high factor scores on this dimension include actors, dancers and former members of the armed forces.

Factor 10: Other Workers

This dimension has high positive loadings on percentage of other males, percentage of other females, 12 and 13-15 years of education and 50-52 weeks worked. It has negative loadings on 40-49 weeks worked and 30-34 and 35-39 hours worked per week. The other variable sets have little or no impact on this dimension.

It appears that other workers are effectively delegated to a rather unique segment of the occupational structure of the labor market. However, they do not appear to be penalized for their color characteristic. The dimension does not exhibit significant negative loadings on the upper range of the earnings structure, nor significant positive loadings on unemployment. While not being penalized, they are effectively segregated to a unique segment of the occupational structure.

It is important to remember that this dimension is uncorrelated with the "nonwhite worker" dimension. This effectively means that other workers are delegated to two separate segments of the labor market, one that is uniquely their own and one that they share with Negro workers. Occupations that have high factor scores on this dimension include firemen, farm foremen and farm managers.

A.3 Summary

The primary goal of this chapter has been to identify a segment of the labor market which is highly favorable for youth employment. A set of youth favorable occupations was assembled based on a methodology which relied on the percentage and the number of youth in an occupation as a guide to the occupation's favorability for youth employment. It was shown that youth are disproportionately concentrated in a few occupations. These occuaptions, which are primarily of a part-time nature, tend to exhibit low levels of education and remuneration. Occupations which are important for male youth tend to be quite different from those that are important for female youth. Within the sex-specific youth occupational sets, the younger group of cohorts tend to be more concentrated in occupations that exhibit low hours worked and low levels of education and remuneration than the older group of cohorts. Between sex-specific youth occupational sets, male youth favorable occupations provide a greater level of remuneration and are less of a part-time nature than female youth favorable occupations. This is true when one is considering all occupational members, only the older group of cohorts, or only the younger group of cohorts.

It was shown that the occupational set cannot be conceptualized as a youth labor market. To do so would exclude 40-60 percent of youth from the youth labor market. Neither can the set of occupations be considered the principal segment of a youth labor market. Such an approach implicitly assumes the existence of a youth labor market. In order to accept occupations with a high percentage of youth in them as being the principal segments of a youth labor market, one must accept, a priori, the existence of a labor market for youth. In order to solve for these problems, an empirical tool which did not rely on prior information, was sought.

The primary goal of the second half of the chapter was to identify the principal dimensions of occupational labor market segmentation using a broad base of occupational variables. The data base was comprised of eight labor market variable sets computed from the 1970 census tabulations. The chief empirical tool used in the investigation was the principal component model with special reference to factor analysis and factor rotation techniques. The matrix of scaled eigenvectors, referred to as the factor loading matrix, was rotated to orthogonal simple structure using the varimax method to facilitate interpretation. It was found that 81 percent of the variance in the original data matrix could be embodied in ten basic dimensions.

Without relying on prior information, a "peripheral worker" segment of the labor market was identified. It was reassuring to note that this dimension was the most important of the ten dimensions which defined the occupational variable space. Youth was found to be the most important demographic group in this segment of the labor market. Occupations found in the "peripheral worker" segment were characterized as being of a predominately part-time nature with very low levels of remuneration. Some of the principal occupations found in the segment included, library attendants, teacher aides, waiters and ushers. None of the remaining nine segments were found to be as important for youth as the "peripheral worker" segment.

APPENDIX B

COUNTY GROUP AGGREGATION

The one in one hundred public use sample of basic records from the 1970 census served as the primary data source for this study. The 1970 public use sample is a representative sample of the records from the 1970 census sample questionnaires. The primary sample size is one in a hundred, or one sample household for every one hundred households in the population. For each household, information is provided about the housing unit itself as well as the characteristics of the household members. The data base is thus very rich in information.

Each individual in the sample is identified as living in one of 408 county group areas or sub-areas, as designated by the Bureau of Economic Analysis, Regional Economics Division. The areas are based on a nodal-functional area concept. That is to say, to each urban center are attached those surrounding county units where economic activity is focused directly or indirectly on that center. These areas represent an extension of the SMSA concept. SMSA's are normally at the center of these areas. In rural parts of the country, the economic centers are cities of 20,000 to 50,000 population.

The use of county group divisions permits disaggregation of the data on two different levels: county groups, of which there are 149, and sub-areas of county groups, of which there are 408. Unfortunately, at both levels of disaggregation a severe problem is encountered. Many of the county groups have very small sample populations; i.e., less than 3500 individuals. For many of these county groups, less than 1000 individuals in the sample population are employed. When a work force this small is disaggregated on the basis of age, sex, color and educational classes, as in the case of the demand model, the population of most of the classes is well below 50. This is especially true in the case of youth classes. It was felt that the standard errors encountered in working with such small classes were more than totally undesirable. The logical course of action is then to aggregate the data.[1] Unfortunately, the county group concept provides no guide to the possible aggregation of county groups.

The aggregation problem encountered in this study has led to the development of a methodology that leads to county group aggregation based on the economic structure of regions. It proceeds on the assumption that the economic structure of regions is multidimensional and cannot be adequately captured by any one measure. It restricts itself to the characteristics of the employed population in the county groups.

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[1]Aggregation will not, of course, reduce the standard errors. However, it will reduce the standard error of the proportions. Since this study works primarily with proportions, aggregation is desirable.

The methodology used in deriving the aggregated county groups is actually rather straightforward. First, it is necessary to identify the major, uncorrelated dimensions of the economic structure based on employment characteristics. This is accomplished with the aid of a component model and is discussed in some detail in Section B.2. Second, it is necessary to determine the relationship between county groups in terms of the dimensions of economic structure. The distance model which was developed to accomplish this end is discussed in Section B.3. Lastly, county groups which have like economic structures of employment must be identified. This is basically a cluster problem and is discussed in Section B.4.

B.1 The Data Base

For a large number of variables used in deriving aggregated county groups, percentage frequency distributions were utilized. Percentage frequency distributions were used to capture the variance and skew of the variables within county groups. This information would have been lost if a central tendency measure had been employed.

The data was compiled directly from the one in one hundred public use samples of basic records from the 1970 census. The sample population used to construct the various variables and variable groups includes only the noninstitutionalized civilian labor force over 15 years of age (NCLF). The various variables and variable groups were then compiled from subsets of the sample population. Table B-1 gives a complete breakdown of which subsets were used in compiling the various variables and variable groups.

The county group variables selected for use in deriving aggregated county groups include: the percentage of the employed NCLF who are white males, black males, other than white or black males, white females, black females, other than white or black females, and the percentage of the NCLF who are unemployed. Percentage frequency distributions were employed for the ages of the employed NCLF, the years of education of the employed NCLF, the hours worked by the employed NCLF who reported hours worked, the weeks worked by the employed NCLF who reported weeks worked, the industries and the occupations of the employed NCLF, and the earnings of the NCLF who reported earnings.

The empirical tool used in this study assumes a bivariate normal distribution. The data was tested using the Kolmogorov-Smirnov one-sample test. The distribution of the variable across cases was found to be significantly different from normal at the five percent level for all 83 variables. The distribution of variables across cases was normalized using a basic grouping algorithm. While a

Table B-1

Subsets of the Noninstitutionalized Civilian Labor Force Used to Construct the Percentages

Variable or Variable Group	Subset and denominator used in constructing percentages
Sex-color	individuals employed during census week, 1970
Age	individuals employed during census week, 1970
Education	individuals employed during census week, 1970
Hours worked	individuals employed during census week, 1970 and who reported hours worked in previous week
Weeks worked	individuals employed during census week, 1970 and who reported weeks worked in previous year
Earnings	individuals employed during census week, 1970 and who reported earnings in previous year
Occupation	individuals employed during census week, 1970
Industry	individuals employed during census week, 1970
Unemployment	noninstitutionalized civilian labor force over 15 years of age

univariate normal distribution is not sufficient for the bivariate distribution to be normal, it does increase the likelihood.

B.2 The Principal Component Model

Principal component analysis can be used to identify the major, uncorrelated dimensions of the economic structure of county groups. It is capable of uncovering the independent sources of variation within the set of data. When interdependencies exist in the data, the principal component model can be used to ask the question, "Can the same amount of variation in the data be represented equally well by dimensions smaller in number than the number of variables in the original data matrix?" The dimensions uncovered by the principal component model can be interpreted as measures of the amount of systematic variation in the data matrix. The degree to which interdependencies exist in the data can be measured by the strength of some minimum number of dimensions.[2]

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[2]Earlier studies have had some success in using component analysis or factor analysis to uncover the basic dimensions of regional structure. See, for example, Christen Jonassen and Sherwood Peres, Interrelationships of Dimensions of Community Systems: A Factor Analysis of Eighty-two Variables (Columbus: Ohio State University Press, 1960).

There will be no mathematical statement of the principal component model here, nor will the relationship between the principal component model and factor analysis be developed. The interested reader may refer to Section A.2.1 for a discussion of these areas. Instead, the discussion will proceed immediately to a presentation of the empirical results of the component model.

B.2.1 The unrotated factor matrix

The principal axis method of factor analysis was applied to the product moment correlation matrix. Table B-2 presents the mathematically unique unrotated factor loadings matrix (F) for the first ten factors. The factor loading f_{kj} is the product moment correlation of the kth variable with the jth factor dimension. As can be observed from Table B-2, about 42 percent of the variance of percentage white male could be explained by the third factor.

The number of independent sources of variance in the data matrix is equal to the number of factors which can be extracted from the data. The latter is equal to the rank of the matrix or the number of variables in the case of the component model. However, the extraction of a number of factors equal to the original number of variables hardly implies a parsimonious solution. For this reason, factoring is usually stopped before all possible factors are extracted.

TABLE B-2

UNROTATED FACTOR MATRIX

REGIONAL CHARACTERISTIC	FACTOR 1	2	3	4	5	6	7
PERCENT WHITE MALE	-0.059	-0.398*	0.651**	-0.352*	-0.097	0.067	-0.179
PERCENT BLACK MALE	0.155	0.594**	-0.563**	0.139	0.119	-0.086	-0.062
PERCENT OTHER MALE	-0.470*	-0.246	-0.266*	0.046	-0.208	-0.286*	-0.025
PERCENT WHITE FEMALE	-0.271*	-0.296*	0.418*	0.252*	0.075	0.057	0.385*
PERCENT BLACK FEMALE	0.139	0.575**	-0.593**	0.186	0.117	-0.030	-0.064
PERCENT OTHER FEMALE	-0.419*	-0.262*	-0.292*	0.057	-0.249	-0.222	0.065
PERCENT 16-17 YEARS OLD	-0.239	-0.449*	0.274*	-0.071	0.443*	0.018	0.141
PERCENT 18-19 YEARS OLD	-0.009	-0.325*	0.219	-0.093	0.266*	-0.270*	0.295*
PERCENT 20-24 YEARS OLD	0.095	0.031	-0.354*	-0.025	-0.029	-0.274*	0.595**
PERCENT 25-29 YEARS OLD	0.015	0.276*	-0.419*	-0.373*	-0.055	-0.169	0.418*
PERCENT 30-34 YEARS OLD	-0.029	0.192	-0.290*	-0.583**	-0.006	-0.068	0.127
PERCENT 35-39 YEARS OLD	-0.126	0.164	-0.198	-0.586**	0.097	0.046	-0.095
PERCENT 40-44 YEARS OLD	-0.175	0.176	0.043	-0.244	0.067	0.115	-0.488*
PERCENT 45-49 YEARS OLD	-0.282*	0.255*	0.247	-0.063	-0.024	0.063	-0.412*
PERCENT 50-54 YEARS OLD	-0.077	0.150	0.311*	0.383*	-0.061	0.105	-0.438*
PERCENT 55-59 YEARS OLD	0.181	-0.121	0.296*	0.554**	-0.204	0.029	-0.244
PERCENT 60-64 YEARS OLD	0.309*	-0.169	0.215	0.639**	-0.173	0.214	-0.142
PERCENT 65-69 YEARS OLD	0.328*	-0.352*	0.099	0.548**	-0.036	0.209	-0.117
PERCENT 70-++ YEARS OLD	0.273*	-0.417*	0.198	0.531**	-0.034	0.194	-0.060
PERCENT WITH 00-04 YEARS OF EDUCATION	0.455*	0.423*	-0.549**	0.026	0.073	-0.066	-0.163
PERCENT WITH 05-07 YEARS OF EDUCATION	0.594**	0.576**	-0.268*	0.061	0.097	0.052	-0.105
PERCENT WITH 8 YEARS OF EDUCATION	0.539**	-0.109	0.581**	0.166	-0.040	0.043	-0.020
PERCENT WITH 09-11 YEARS OF EDUCATION	0.338*	0.570**	0.005	0.007	0.259*	-0.042	-0.102
PERCENT WITH 12 YEARS OF EDUCATION	-0.311*	-0.235	0.642**	-0.090	-0.282*	-0.048	0.034
PERCENT WITH 13-15 YEARS OF EDUCATION	-0.593**	-0.517**	-0.354*	-0.025	-0.091	-0.107	0.072
PERCENT WITH 16 YEARS OF EDUCATION	-0.620**	-0.141	-0.440*	-0.020	0.116	0.244	0.060
PERCENT WITH 17-++ YEARS OF EDUCATION	-0.744**	-0.308*	-0.259*	0.123	-0.059	0.006	0.086
PERCENT WHO WORKED 01-14 HOURS	-0.029	-0.707**	0.166	0.184	0.153	-0.204	0.106
PERCENT WHO WORKED 15-29 HOURS	-0.156	-0.617**	0.162	0.272*	0.221	-0.152	0.109
PERCENT WHO WORKED 30-34 HOURS	-0.078	0.418*	0.302*	0.193	0.394*	-0.269*	-0.100
PERCENT WHO WORKED 35-39 HOURS	-0.444*	0.473*	0.172	0.417*	0.192	0.074	-0.001
PERCENT WHO WORKED 40 HOURS	-0.026	0.582**	-0.318*	-0.201	-0.465*	-0.155	0.084
PERCENT WHO WORKED 41-48 HOURS	0.058	-0.029	0.203	-0.169	0.558**	0.141	-0.087
PERCENT WHO WORKED 49-59 HOURS	0.252*	-0.522**	0.052	-0.288*	0.405*	0.237	-0.078
PERCENT WHO WORKED 60-++ HOURS	0.523**	-0.650**	-0.031	-0.304*	-0.079	0.204	-0.080
PERCENT WHO WORKED 01-13 WEEKS	0.015	-0.500**	-0.206	0.040	0.176	-0.284*	-0.141
PERCENT WHO WORKED 14-29 WEEKS	0.154	-0.463*	-0.166	0.018	0.072	-0.429*	0.134
PERCENT WHO WORKED 27-39 WEEKS	0.480*	-0.310*	-0.183	-0.038	0.046	-0.391*	-0.073
PERCENT WHO WORKED 40-47 WEEKS	-0.176	0.364*	0.004	0.350*	0.231	-0.525**	-0.156
PERCENT WHO WORKED 48-49 WEEKS	-0.293*	0.431*	-0.027	0.327*	0.324*	-0.388*	-0.134
PERCENT WHO WORKED 50-52 WEEKS	-0.011	0.018	0.166	-0.307*	-0.322*	0.763**	0.182
PERCENT IN AGRICULTURE, FORESTRY, AND FISHERIES	0.640**	-0.617**	0.037	-0.205	0.074	0.015	-0.089
PERCENT IN MINING	0.316*	-0.156	-0.052	-0.242	-0.387*	0.073	-0.218
PERCENT IN CONSTRUCTION	0.336*	-0.054	-0.323*	-0.325*	0.016	0.063	-0.229
PERCENT IN MANUFACTURING-DURABLE GOODS	-0.147	0.369*	0.640**	-0.103	0.212	-0.184	0.084
PERCENT IN MANUFACTURING-NONDURABLE GOODS	0.375*	0.526**	0.199	0.155	0.215	0.174	0.186
PERCENT IN TRAN., COMM., & OTHER PUBLIC UTILITIES	-0.289*	0.118	-0.223	0.044	-0.412*	0.064	-0.284*
PERCENT IN WHOLESALE TRADE	-0.439*	0.024	-0.294*	0.116	0.169	0.097	-0.181
PERCENT IN RETAIL TRADE	-0.154	-0.569**	-0.147	0.002	0.017	-0.019	-0.404*
PERCENT IN FINANCE, INSURANCE, AND REAL ESTATE	-0.666**	0.024	-0.324*	0.260*	0.045	0.151	-0.025
PERCENT IN BUSINESS & REPAIR SERVICES	-0.631**	-0.000	-0.394*	0.053	0.015	0.110	-0.097

TABLE B-2 CONTINUED

UNROTATED FACTOR MATRIX

REGIONAL CHARACTERISTIC	FACTOR 1	2	3	4	5	6	7
PERCENT IN PERSONAL SERVICES	0.458*	-0.049	-0.662**	0.084	-0.165	-0.007	-0.140
PERCENT IN ENTERTAINMENT & RECREATION SERVICES	-0.418*	-0.204	-0.171	0.070	0.051	-0.070	-0.126
PERCENT IN PROFESSIONAL & RELATED SERVICES	-0.325*	-0.547**	-0.253*	0.262*	-0.225	-0.117	0.204
PERCENT IN PUBLIC ADMINISTRATION	-0.284*	-0.148	-0.478*	0.090	-0.384*	-0.019	0.000
PERCENT PROFESSIONAL,TECH., & KINDRED WORKERS	-0.785**	-0.195	-0.284*	-0.025	-0.039	0.086	0.137
PERCENT MANAGERS & ADMINISTRATORS	-0.402*	-0.387*	-0.440*	-0.110	0.126	0.289*	-0.271*
PERCENT SALES WORKERS	-0.609**	-0.110	-0.227	0.065	0.241	0.172	-0.235
PERCENT CLERICAL & KINDRED WORKERS	-0.787**	0.143	-0.199	0.266*	-0.111	0.048	0.154
PERCENT CRAFTSMEN & KINDRED WORKERS	0.123	0.465*	0.360*	-0.393*	-0.003	-0.182	-0.271*
PERCENT OPERATIVES, EXCEPT TRANSPORT	0.485*	0.538**	0.492*	-0.018	0.168	-0.065	0.197
PERCENT TRANSPORT EQUIPMENT OPERATIVES	0.506**	0.182	0.119	-0.058	-0.272*	-0.101	-0.244
PERCENT LABORERS, EXCEPT FARM	0.554**	0.175	-0.053	-0.108	-0.192	-0.375*	-0.250*
PERCENT FARMERS & FARM MANAGERS	0.650**	-0.569**	0.226	-0.168	0.053	0.051	0.032
PERCENT FARM LABORERS & FARM FOREMAN	0.641**	-0.490*	-0.134	-0.203	0.099	-0.130	-0.123
PERCENT SERVICE WORKERS, EXC. PRIVATE HOUSEHOLD	-0.028	-0.506**	-0.039	0.253*	-0.447*	-0.283*	-0.074
PERCENT PRIVATE HOUSEHOLD WORKERS	0.558**	-0.004	-0.583**	0.003	-0.017	0.088	-0.120
PERCENT WHO EARNED 00000-00099 DOLLARS	0.346*	-0.520**	-0.103	-0.001	0.174	-0.039	-0.117
PERCENT WHO EARNED 00100-00999 DOLLARS	0.573**	-0.608**	-0.219	-0.043	0.189	-0.084	-0.031
PERCENT WHO EARNED 01000-01999 DOLLARS	0.639**	-0.497*	-0.171	0.133	0.127	-0.024	-0.011
PERCENT WHO EARNED 02000-02999 DOLLARS	0.741**	-0.167	-0.322*	0.123	0.073	-0.005	0.006
PERCENT WHO EARNED 03000-03999 DOLLARS	0.832**	0.105	-0.268*	0.154	0.009	0.036	0.084
PERCENT WHO EARNED 04000-04999 DOLLARS	0.674**	0.245	-0.258*	0.244	0.017	0.130	0.199
PERCENT WHO EARNED 05000-05999 DOLLARS	0.475*	0.402*	-0.042	0.278*	-0.136	0.236	0.166
PERCENT WHO EARNED 06000-06999 DOLLARS	0.149	0.117	0.228	0.176	-0.553**	0.170	0.177
PERCENT WHO EARNED 07000-07999 DOLLARS	-0.278*	0.129	0.492*	-0.060	-0.486*	-0.069	-0.004
PERCENT WHO EARNED 08000-09999 DOLLARS	-0.582**	0.107	0.515**	-0.163	-0.215	-0.203	-0.082
PERCENT WHO EARNED 10000-11999 DOLLARS	-0.811**	0.017	0.271*	-0.222	-0.002	-0.159	-0.148
PERCENT WHO EARNED 12000-14999 DOLLARS	-0.877**	-0.023	0.098	-0.218	0.024	-0.075	-0.084
PERCENT WHO EARNED 15000-25999 DOLLARS	-0.877**	-0.031	-0.067	-0.118	0.121	0.079	0.003
PERCENT WHO EARNED 26000-34999 DOLLARS	-0.663**	-0.001	-0.174	0.119	0.286*	0.149	-0.048
PERCENT WHO EARNED 35000-+++++ DOLLARS	-0.559**	0.041	-0.103	0.136	0.291*	0.240	-0.115
PERCENT UNEMPLOYED	-0.017	-0.044	0.118	0.043	-0.260*	-0.586**	-0.260*
EIGEN VALUE	16.710	10.780	8.210	4.750	4.020	3.470	2.990
PERCENT VARIANCE	20.130	12.980	9.890	5.720	4.850	4.180	3.600

TABLE B-2 CONTINUED

UNROTATED FACTOR MATRIX

REGIONAL CHARACTERISTIC	FACTOR 8	9	10	11	12	13	14
PERCENT WHITE MALE	-0.059	-0.398*	0.651**	-0.352*	-0.097	0.057	-0.179
PERCENT BLACK MALE	0.155	0.594**	-0.563**	0.139	0.119	-0.086	-0.062
PERCENT OTHER MALE	-0.470*	-0.246	-0.266*	0.046	-0.208	-0.286*	-0.025
PERCENT WHITE FEMALE	-0.271*	-0.296*	0.418*	0.252*	0.075	0.057	0.385*
PERCENT BLACK FEMALE	0.139	0.575**	-0.593**	0.186	0.117	-0.030	-0.064
PERCENT OTHER FEMALE	-0.419*	-0.262*	-0.292*	0.057	-0.249	-0.222	0.065
PERCENT 16-17 YEARS OLD	-0.239	-0.449*	0.274*	-0.071	0.443*	0.018	0.141
PERCENT 18-19 YEARS OLD	-0.009	-0.325*	0.219	-0.093	0.266*	-0.270*	0.295*
PERCENT 20-24 YEARS OLD	0.095	0.031	-0.354*	-0.025	-0.029	-0.274*	0.595**
PERCENT 25-29 YEARS OLD	0.015	0.276*	-0.419*	-0.373*	-0.055	-0.159	0.418*
PERCENT 30-34 YEARS OLD	-0.029	0.192	-0.290*	-0.583**	-0.006	-0.068	0.127
PERCENT 35-39 YEARS OLD	-0.126	0.164	-0.198	-0.586**	0.097	0.046	-0.095
PERCENT 40-44 YEARS OLD	-0.175	0.176	0.043	-0.244	0.067	0.115	-0.488*
PERCENT 45-49 YEARS OLD	-0.282*	0.255*	0.247	-0.063	-0.024	0.063	-0.412*
PERCENT 50-54 YEARS OLD	-0.077	0.150	0.311*	0.383*	-0.061	0.105	-0.438*
PERCENT 55-59 YEARS OLD	0.181	-0.121	0.296*	0.554**	-0.204	0.029	-0.244
PERCENT 60-64 YEARS OLD	0.309*	-0.169	0.215	0.639**	-0.173	0.214	-0.142
PERCENT 65-69 YEARS OLD	0.328*	-0.352*	0.099	0.548**	-0.036	0.209	-0.117
PERCENT 70-++ YEARS OLD	0.273*	-0.417*	0.198	0.531**	-0.034	0.194	-0.060
PERCENT WITH 00-04 YEARS OF EDUCATION	0.455*	0.423*	-0.549**	0.026	0.073	-0.066	-0.163
PERCENT WITH 05-07 YEARS OF EDUCATION	0.594**	0.576**	-0.268*	0.061	0.097	0.052	-0.105
PERCENT WITH 8 YEARS OF EDUCATION	0.539**	-0.109	0.581**	0.166	-0.040	0.043	-0.020
PERCENT WITH 09-11 YEARS OF EDUCATION	0.338*	0.570**	0.005	0.007	0.259*	-0.042	-0.102
PERCENT WITH 12 YEARS OF EDUCATION	-0.311*	-0.235	0.642**	-0.090	-0.282*	-0.048	0.034
PERCENT WITH 13-15 YEARS OF EDUCATION	-0.593**	-0.517**	-0.354*	-0.025	-0.091	-0.107	0.072
PERCENT WITH 16 YEARS OF EDUCATION	-0.620**	-0.141	-0.440*	-0.020	0.116	0.244	0.060
PERCENT WITH 17-++ YEARS OF EDUCATION	-0.744**	-0.308*	-0.259*	0.123	-0.059	0.006	0.086
PERCENT WHO WORKED 01-14 HOURS	-0.029	-0.707**	0.166	0.184	0.153	-0.204	0.106
PERCENT WHO WORKED 15-29 HOURS	-0.156	-0.617**	0.162	0.272*	0.221	-0.152	0.109
PERCENT WHO WORKED 30-34 HOURS	-0.078	0.418*	0.302*	0.193	0.394*	-0.269*	-0.100
PERCENT WHO WORKED 35-39 HOURS	-0.444*	0.473*	0.172	0.417*	0.192	0.074	-0.001
PERCENT WHO WORKED 40 HOURS	-0.026	0.582**	-0.318*	-0.201	-0.465*	-0.155	0.084
PERCENT WHO WORKED 41-48 HOURS	0.058	-0.029	0.203	-0.169	0.558**	0.141	-0.087
PERCENT WHO WORKED 49-59 HOURS	0.252*	-0.522**	0.052	-0.288*	0.405*	0.237	-0.078
PERCENT WHO WORKED 60-++ HOURS	0.523**	-0.650**	-0.031	-0.304*	-0.079	0.204	-0.080
PERCENT WHO WORKED 01-13 WEEKS	0.015	-0.500**	-0.206	0.040	0.176	-0.284*	-0.141
PERCENT WHO WORKED 14-29 WEEKS	0.154	-0.463*	-0.166	0.018	0.072	-0.429*	0.134
PERCENT WHO WORKED 27-39 WEEKS	0.480*	-0.310*	-0.183	-0.038	0.046	-0.391*	-0.073
PERCENT WHO WORKED 40-47 WEEKS	-0.176	0.364*	0.004	0.350*	0.231	-0.525**	-0.156
PERCENT WHO WORKED 48-49 WEEKS	-0.293*	0.431*	-0.027	0.327*	0.324*	-0.386*	-0.134
PERCENT WHO WORKED 50-52 WEEKS	-0.011	0.018	0.166	-0.307*	-0.322*	0.763**	0.182
PERCENT IN AGRICULTURE, FORESTRY, AND FISHERIES	0.640**	-0.617**	0.037	-0.205	0.074	0.015	-0.089
PERCENT IN MINING	0.316*	-0.156	-0.052	-0.242	-0.387*	0.073	-0.218
PERCENT IN CONSTRUCTION	0.336*	-0.054	-0.323*	-0.325*	0.016	0.063	-0.229
PERCENT IN MANUFACTURING-DURABLE GOODS	-0.147	0.369*	0.640**	-0.103	0.212	-0.134	0.084
PERCENT IN MANUFACTURING-NONDURABLE GOODS	0.375*	0.526**	0.199	0.155	0.215	0.174	0.186
PERCENT IN TRAN., COMM., & OTHER PUBLIC UTILITIES	-0.289*	0.118	-0.223	0.044	-0.412*	0.064	-0.284*
PERCENT IN WHOLESALE TRADE	-0.439*	0.024	-0.294*	0.116	0.169	0.097	-0.181
PERCENT IN RETAIL TRADE	-0.154	-0.569**	-0.147	0.002	0.017	-0.019	-0.404*
PERCENT IN FINANCE, INSURANCE, AND REAL ESTATE	-0.666**	0.024	-0.324*	0.260*	0.045	0.151	-0.025
PERCENT IN BUSINESS & REPAIR SERVICES	-0.631**	-0.000	-0.394*	0.053	0.015	0.110	-0.097

TABLE B-2 CONTINUED

UNROTATED FACTOR MATRIX

REGIONAL CHARACTERISTIC	FACTOR 8	9	10	11	12	13	14
PERCENT IN PERSONAL SERVICES	0.458*	-0.049	-0.662**	0.084	-0.165	-0.007	-0.140
PERCENT IN ENTERTAINMENT & RECREATION SERVICES	-0.418*	-0.204	-0.171	0.070	0.051	-0.070	-0.126
PERCENT IN PROFESSIONAL & RELATED SERVICES	-0.325*	-0.547**	-0.253*	0.262*	-0.225	-0.117	0.204
PERCENT IN PUBLIC ADMINISTRATION	-0.284*	-0.148	-0.478*	0.090	-0.384*	-0.019	0.000
PERCENT PROFESSIONAL,TECH., & KINDRED WORKERS	-0.785**	-0.195	-0.284*	-0.025	-0.039	0.086	0.137
PERCENT MANAGERS & ADMINISTRATORS	-0.402*	-0.387*	-0.440*	-0.110	0.126	0.289*	-0.271*
PERCENT SALES WORKERS	-0.609**	-0.110	-0.227	0.065	0.241	0.172	-0.235
PERCENT CLERICAL & KINDRED WORKERS	-0.787**	0.143	-0.199	0.266*	-0.111	0.048	0.154
PERCENT CRAFTSMEN & KINDRED WORKERS	0.123	0.465*	0.360*	-0.393*	-0.003	-0.182	-0.271*
PERCENT OPERATIVES, EXCEPT TRANSPORT	0.485*	0.538**	0.492*	-0.018	0.168	-0.055	0.197
PERCENT TRANSPORT EQUIPMENT OPERATIVES	0.506**	0.182	0.119	-0.058	-0.272*	-0.101	-0.244
PERCENT LABORERS, EXCEPT FARM	0.554**	0.175	-0.053	-0.108	-0.192	-0.375*	-0.250*
PERCENT FARMERS & FARM MANAGERS	0.650**	-0.569**	0.226	-0.168	0.053	0.051	0.032
PERCENT FARM LABORERS & FARM FOREMAN	0.641**	-0.490*	-0.134	-0.203	0.099	-0.100	-0.123
PERCENT SERVICE WORKERS, EXC. PRIVATE HOUSEHOLD	-0.028	-0.506**	-0.039	0.253*	-0.447*	-0.283*	-0.074
PERCENT PRIVATE HOUSEHOLD WORKERS	0.558**	-0.004	-0.583**	0.003	-0.017	0.088	-0.120
PERCENT WHO EARNED 00000-00099 DOLLARS	0.346*	-0.520**	-0.103	-0.001	0.174	-0.039	-0.117
PERCENT WHO EARNED 00100-00999 DOLLARS	0.573**	-0.608**	-0.219	-0.043	0.189	-0.084	-0.031
PERCENT WHO EARNED 01000-01999 DOLLARS	0.639**	-0.497*	-0.171	0.133	0.127	-0.024	-0.011
PERCENT WHO EARNED 02000-02999 DOLLARS	0.741**	-0.167	-0.322*	0.123	0.073	-0.005	0.006
PERCENT WHO EARNED 03000-03999 DOLLARS	0.832**	0.105	-0.268*	0.154	0.009	0.036	0.084
PERCENT WHO EARNED 04000-04999 DOLLARS	0.674**	0.245	-0.258*	0.244	0.017	0.190	0.199
PERCENT WHO EARNED 05000-05999 DOLLARS	0.475*	0.402*	-0.042	0.278*	-0.136	0.236	0.166
PERCENT WHO EARNED 06000-06999 DOLLARS	0.149	0.117	0.228	0.176	-0.553**	0.170	0.177
PERCENT WHO EARNED 07000-07999 DOLLARS	-0.278*	0.129	0.492*	-0.060	-0.496*	-0.069	-0.004
PERCENT WHO EARNED 08000-09999 DOLLARS	-0.582**	0.107	0.515**	-0.163	-0.215	-0.203	-0.082
PERCENT WHO EARNED 10000-11999 DOLLARS	-0.811**	0.017	0.271*	-0.222	-0.002	-0.159	-0.148
PERCENT WHO EARNED 12000-14999 DOLLARS	-0.877**	-0.023	0.098	-0.218	0.024	-0.075	-0.084
PERCENT WHO EARNED 15000-25999 DOLLARS	-0.877**	-0.031	-0.067	-0.118	0.121	0.079	0.003
PERCENT WHO EARNED 26000-34999 DOLLARS	-0.663**	-0.001	-0.174	0.119	0.286*	0.149	-0.048
PERCENT WHO EARNED 35000-+++++ DOLLARS	-0.559**	0.041	-0.103	0.136	0.291*	0.240	-0.115
PERCENT UNEMPLOYED	-0.017	-0.044	0.118	0.043	-0.260*	-0.586**	-0.260*
EIGEN VALUE	1.970	1.930	1.400	1.360	1.270	1.120	1.030
PERCENT VARIANCE	2.370	2.330	1.960	1.640	1.530	1.350	1.240

NOTE: ** IS USED TO SIGNIFY LOADINGS GREATER IN ABSOLUTE VALUE THEN .50, WHILE * IS USED TO SIGNIFY LOADINGS GREATER IN ABSOLUTE VALUE THEN .25 BUT LESS THEN .50

There are a large number of decision criteria that have been suggested as when to stop factoring.[3] The more popular eigenvalue-one decision rule is utilized in this analysis. Only those factors with eigenvalues greater than unity were extracted.

The first factor extracted is capable of explaining over 20 percent of the variation in the data matrix. The pattern of factor loadings can be readily interpreted in an economic context. The factor has high positive loadings on the lower range of the educational distribution, the lower range of the earnings distribution and on most of the blue-collar occupations. The factor could be tagged with the label, "blue-collar worker". In general, county groups heavily populated by workers with a low level of educational attainment and low levels of earnings, and who are employed primarily in blue collar occupations would have high factor scores on this dimension.

The second factor is capable of explaining over 12 percent of the variation in the data matrix. It has high positive loadings on the percentage of black males, the percentage of black females, the lower range of the

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[3]For a detailed discussion of some of the more popular decision rules, see R. J. Rummel, Applied Factor Analysis (Evanston: Northwestern University Press, 1970), pp. 349-367.

educational distribution, and the middle range of the hours worked distribution. It also has high positive factor loadings on the percent of workers employed in manufacturing- nondurable goods and as operatives, except transport. The best label for this factor would probably be "black workers with low educational attainment".

It would be possible to continue in this manner and describe all fourteen factors. However, as the percent of variance that could be explained by the factor diminishes, so does its interpretability. To facilitate the interpretation of the dimensions, techniques of matrix rotation to simple structure were applied to the factor matrix.[4] In the following section, an interpretation of the orthogonal rotated factor matrix is presented.

B.2.2 The orthogonal rotated factor matrix

Table B-3 presents the results of an orthogonal varimax rotation of the initial factor matrix. The varimax criterion for rotation is a function of the variance of the factor loadings. The objective of the varimax method of rotation is to determine some orthogonal transformation matrix (T) which will carry the original factor matrix (A) into a new factor matrix (B) for which the variance of

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[4] For a discussion of the objectives of, and the criteria for, simple structure see, Rummel, pp. 380-382.

TABLE B-3

ROTATED FACTOR MATRIX

REGIONAL CHARACTERISTIC	FACTOR 1	2	3	4	5	6	7
PERCENT WHITE MALE	-0.148	0.252*	-0.360*	-0.677**	0.017	-0.069	0.140
PERCENT BLACK MALE	-0.058	-0.250*	0.153	0.865**	-0.110	0.033	0.002
PERCENT OTHER MALE	0.442*	0.003	-0.066	-0.122	-0.156	0.350*	-0.395*
PERCENT WHITE FEMALE	0.171	-0.202	0.112	-0.730**	0.207	0.024	0.125
PERCENT BLACK FEMALE	-0.022	-0.263*	0.201	0.866**	-0.077	-0.019	-0.021
PERCENT OTHER FEMALE	0.414*	0.014	0.015	-0.146	-0.159	0.262*	-0.422*
PERCENT 16-17 YEARS OLD	0.170	0.210	-0.236	-0.330*	0.015	-0.099	0.288*
PERCENT 18-19 YEARS OLD	-0.109	0.128	-0.125	-0.310*	-0.096	0.018	0.143
PERCENT 20-24 YEARS OLD	0.009	-0.065	0.185	0.150	-0.262*	-0.010	-0.133
PERCENT 25-29 YEARS OLD	0.024	-0.037	0.119	0.215	-0.605**	0.054	-0.095
PERCENT 30-34 YEARS OLD	0.037	0.103	-0.061	0.132	-0.645**	0.041	0.071
PERCENT 35-39 YEARS OLD	0.053	0.050	-0.014	0.043	-0.635**	-0.093	0.028
PERCENT 40-44 YEARS OLD	0.039	-0.088	-0.063	0.043	-0.214	-0.014	0.102
PERCENT 45-49 YEARS OLD	0.029	-0.288*	-0.201	-0.075	0.002	0.022	0.002
PERCENT 50-54 YEARS OLD	-0.061	-0.251*	-0.075	-0.013	0.485*	0.051	-0.071
PERCENT 55-59 YEARS OLD	-0.150	0.023	-0.008	-0.049	0.693**	0.135	-0.134
PERCENT 60-64 YEARS OLD	-0.144	0.066	0.145	-0.017	0.792**	-0.021	-0.028
PERCENT 65-69 YEARS OLD	-0.052	0.250*	0.122	0.027	0.733**	-0.054	0.070
PERCENT 70-++ YEARS OLD	-0.039	0.240	0.114	-0.130	0.717**	-0.036	0.091
PERCENT WITH 00-04 YEARS OF EDUCATION	-0.193	0.024	0.483*	0.629**	-0.185	0.121	-0.117
PERCENT WITH 05-07 YEARS OF EDUCATION	-0.442*	-0.096	0.506**	0.539**	-0.094	-0.011	0.031
PERCENT WITH 8 YEARS OF EDUCATION	-0.614**	0.173	0.067	-0.325*	0.391*	-0.029	0.086
PERCENT WITH 09-11 YEARS OF EDUCATION	-0.475*	-0.210	0.132	0.465*	-0.100	-0.043	0.250*
PERCENT WITH 12 YEARS OF EDUCATION	-0.111	-0.082	-0.555**	-0.567**	0.156	-0.081	-0.028
PERCENT WITH 13-15 YEARS OF EDUCATION	0.750**	0.141	-0.194	-0.135	-0.080	0.147	-0.117
PERCENT WITH 16 YEARS OF EDUCATION	0.837**	-0.093	-0.061	0.087	-0.124	-0.104	0.003
PERCENT WITH 17-++ YEARS OF EDUCATION	0.840**	-0.133	-0.211	-0.111	0.020	0.088	-0.154
PERCENT WHO WORKED 01-14 HOURS	0.238	0.446*	-0.237	-0.227	0.355*	0.157	0.008
PERCENT WHO WORKED 15-29 HOURS	0.210	0.248	-0.149	-0.356*	0.340*	0.036	-0.139
PERCENT WHO WORKED 30-34 HOURS	-0.302*	-0.463*	-0.098	0.045	0.032	0.210	0.184
PERCENT WHO WORKED 35-39 HOURS	0.138	-0.739**	0.024	-0.044	0.168	0.040	0.052
PERCENT WHO WORKED 40 HOURS	-0.109	-0.341*	-0.025	0.407*	-0.363*	0.003	-0.359*
PERCENT WHO WORKED 41-48 HOURS	-0.015	0.083	0.075	-0.130	-0.102	0.037	0.795**
PERCENT WHO WORKED 49-59 HOURS	0.046	0.621**	0.041	-0.167	-0.024	-0.154	0.495*
PERCENT WHO WORKED 60-++ HOURS	-0.095	0.852**	0.125	-0.163	0.049	-0.187	0.009
PERCENT WHO WORKED 01-13 WEEKS	0.250*	0.438*	0.000	0.006	0.055	0.321*	-0.003
PERCENT WHO WORKED 14-29 WEEKS	0.075	0.379*	0.113	-0.158	-0.011	0.410*	-0.079
PERCENT WHO WORKED 27-39 WEEKS	-0.166	0.498*	0.172	0.042	0.025	0.435*	0.006
PERCENT WHO WORKED 40-47 WEEKS	-0.003	-0.467*	0.030	0.127	0.063	0.658**	0.086
PERCENT WHO WORKED 48-49 WEEKS	0.013	-0.562**	-0.026	0.198	-0.002	0.461*	0.191
PERCENT WHO WORKED 50-52 WEEKS	-0.022	0.060	-0.091	-0.108	-0.053	-0.878**	-0.084
PERCENT IN AGRICULTURE, FORESTRY, AND FISHERIES	-0.220	0.862**	0.163	-0.147	0.100	0.025	0.044
PERCENT IN MINING	-0.130	0.326*	0.124	-0.046	-0.070	-0.015	-0.098
PERCENT IN CONSTRUCTION	-0.033	0.335*	0.344*	0.064	-0.252*	0.011	-0.062
PERCENT IN MANUFACTURING-DURABLE GOODS	-0.326*	-0.367*	-0.522**	-0.086	-0.010	0.045	0.365*
PERCENT IN MANUFACTURING-NONDURABLE GOODS	-0.424*	-0.283*	0.403*	0.014	0.033	-0.072	0.168
PERCENT IN TRAN., COMM., & OTHER PUBLIC UTILITIES	0.129	-0.189	-0.092	0.066	-0.019	0.013	-0.226
PERCENT IN WHOLESALE TRADE	0.376*	-0.195	-0.009	0.081	-0.051	0.038	0.154
PERCENT IN RETAIL TRADE	0.250*	0.348*	-0.098	-0.111	0.136	0.011	-0.067
PERCENT IN FINANCE, INSURANCE, AND REAL ESTATE	0.583**	-0.394*	-0.029	0.057	0.030	-0.051	0.022
PERCENT IN BUSINESS & REPAIR SERVICES	0.604**	-0.269*	-0.013	0.037	-0.152	0.005	-0.079

TABLE B-3 CONTINUED

ROTATED FACTOR MATRIX

REGIONAL CHARACTERISTIC	FACTOR 1	2	3	4	5	6	7
PERCENT IN PERSONAL SERVICES	0.019	0.381*	0.304*	0.659**	0.066	0.046	-0.083
PERCENT IN ENTERTAINMENT & RECREATION SERVICES	0.422*	-0.099	-0.061	-0.045	-0.017	0.142	0.132
PERCENT IN PROFESSIONAL & RELATED SERVICES	0.608**	0.147	-0.081	-0.094	0.241	0.100	-0.329*
PERCENT IN PUBLIC ADMINISTRATION	0.380*	-0.036	0.104	0.087	-0.063	-0.056	-0.601**
PERCENT PROFESSIONAL,TECH., & KINDRED WORKERS	0.843**	-0.201	-0.217	-0.085	-0.138	-0.049	-0.146
PERCENT MANAGERS & ADMINISTRATORS	0.711**	0.246	0.068	-0.047	-0.080	-0.037	0.026
PERCENT SALES WORKERS	0.566**	-0.214	-0.068	-0.043	-0.035	-0.059	0.157
PERCENT CLERICAL & KINDRED WORKERS	0.542**	-0.604**	-0.141	-0.027	-0.014	-0.065	-0.144
PERCENT CRAFTSMEN & KINDRED WORKERS	-0.507**	-0.197	-0.237	0.016	-0.289*	0.053	0.135
PERCENT OPERATIVES, EXCEPT TRANSPORT	-0.711**	-0.234	0.121	-0.014	-0.028	0.021	0.302*
PERCENT TRANSPORT EQUIPMENT OPERATIVES	-0.608**	0.131	0.014	0.134	0.064	0.031	-0.109
PERCENT LABORERS, EXCEPT FARM	-0.511**	0.228	0.015	0.319*	-0.022	0.322*	-0.040
PERCENT FARMERS & FARM MANAGERS	-0.339*	0.781**	0.063	-0.209	0.174	-0.087	0.059
PERCENT FARM LABORERS & FARM FOREMAN	-0.191	0.813**	0.204	0.054	0.010	0.135	0.009
PERCENT SERVICE WORKERS, EXC. PRIVATE HOUSEHOLD	0.082	0.236	-0.167	-0.078	0.331*	0.184	-0.376*
PERCENT PRIVATE HOUSEHOLD WORKERS	-0.037	0.441*	0.287*	0.690**	0.052	-0.052	0.019
PERCENT WHO EARNED 00000-00099 DOLLARS	-0.032	0.650**	0.004	0.095	0.174	0.007	0.011
PERCENT WHO EARNED 00100-00999 DOLLARS	-0.067	0.805**	0.164	0.126	0.156	0.048	0.039
PERCENT WHO EARNED 01000-01999 DOLLARS	-0.161	0.646**	0.313*	0.092	0.292*	0.006	-0.024
PERCENT WHO EARNED 02000-02999 DOLLARS	-0.281*	0.450*	0.588**	0.197	0.120	0.059	-0.043
PERCENT WHO EARNED 03000-03999 DOLLARS	-0.446*	0.266*	0.679**	0.265*	0.092	0.021	0.003
PERCENT WHO EARNED 04000-04999 DOLLARS	-0.340*	0.036	0.774**	0.205	0.086	-0.061	0.071
PERCENT WHO EARNED 05000-05999 DOLLARS	-0.357*	-0.185	0.595**	0.110	0.132	-0.057	0.088
PERCENT WHO EARNED 06000-06999 DOLLARS	-0.247	-0.162	0.066	-0.101	0.224	-0.173	-0.070
PERCENT WHO EARNED 07000-07999 DOLLARS	-0.197	-0.315*	-0.480*	-0.238	0.056	-0.069	-0.047
PERCENT WHO EARNED 08000-09999 DOLLARS	-0.022	-0.379*	-0.753**	-0.250*	-0.059	0.012	0.014
PERCENT WHO EARNED 10000-11999 DOLLARS	0.332*	-0.331*	-0.706**	-0.222	-0.191	0.053	-0.036
PERCENT WHO EARNED 12000-14999 DOLLARS	0.508**	-0.310*	-0.628**	-0.160	-0.233	-0.007	-0.046
PERCENT WHO EARNED 15000-25999 DOLLARS	0.674**	-0.333*	-0.415*	-0.118	-0.200	-0.074	0.008
PERCENT WHO EARNED 26000-34999 DOLLARS	0.662**	-0.322*	-0.103	-0.026	-0.016	0.002	0.137
PERCENT WHO EARNED 35000-+++++ DOLLARS	0.552**	-0.308*	-0.106	0.019	0.057	-0.058	0.271*
PERCENT UNEMPLOYED	-0.123	0.052	-0.190	-0.107	0.018	0.689**	-0.206
VARIANCE	11.260	10.660	6.350	6.330	5.320	3.090	3.050
PERCENT VARIANCE	18.450	17.480	10.400	10.380	8.730	5.070	4.990

TABLE B-3 CONTINUED

ROTATED FACTOR MATRIX

REGIONAL CHARACTERISTIC	FACTOR 8	9	10	11	12	13	14
PERCENT WHITE MALE	0.226	-0.012	-0.011	0.050	-0.035	0.261*	0.086
PERCENT BLACK MALE	-0.097	0.047	-0.078	-0.055	-0.023	-0.047	0.023
PERCENT OTHER MALE	0.122	0.071	0.170	0.154	-0.021	-0.210	-0.331*
PERCENT WHITE FEMALE	-0.182	-0.119	0.103	0.025	0.168	-0.135	0.003
PERCENT BLACK FEMALE	-0.075	0.063	-0.082	-0.020	0.011	-0.058	0.012
PERCENT OTHER FEMALE	0.050	0.091	0.215	0.190	-0.012	-0.244	-0.338*
PERCENT 16-17 YEARS OLD	0.003	-0.081	-0.116	0.121	0.295*	-0.454*	-0.227
PERCENT 18-19 YEARS OLD	-0.274*	0.045	-0.130	0.103	0.602**	-0.044	-0.053
PERCENT 20-24 YEARS OLD	-0.638**	-0.081	0.056	0.054	0.386*	0.094	0.072
PERCENT 25-29 YEARS OLD	-0.394*	-0.012	0.101	-0.121	-0.199	-0.065	-0.078
PERCENT 30-34 YEARS OLD	-0.174	0.117	-0.021	-0.139	-0.338*	0.162	-0.094
PERCENT 35-39 YEARS OLD	0.224	0.041	-0.103	0.066	-0.136	0.039	-0.039
PERCENT 40-44 YEARS OLD	0.655**	0.030	-0.032	0.127	0.000	0.170	-0.059
PERCENT 45-49 YEARS OLD	0.538**	0.034	0.011	-0.117	0.045	0.026	0.296*
PERCENT 50-54 YEARS OLD	0.456*	-0.125	0.001	0.020	-0.116	-0.191	0.268*
PERCENT 55-59 YEARS OLD	0.170	-0.011	0.128	-0.094	-0.077	-0.097	-0.004
PERCENT 60-64 YEARS OLD	-0.013	0.049	0.050	-0.053	-0.136	0.067	-0.065
PERCENT 65-69 YEARS OLD	-0.130	0.036	-0.070	0.083	-0.115	0.088	-0.113
PERCENT 70-++ YEARS OLD	-0.118	0.019	-0.015	0.082	-0.054	0.064	-0.133
PERCENT WITH 00-04 YEARS OF EDUCATION	0.128	-0.032	-0.105	-0.033	-0.076	0.069	0.007
PERCENT WITH 05-07 YEARS OF EDUCATION	0.166	-0.102	-0.055	-0.116	-0.046	0.108	0.022
PERCENT WITH 8 YEARS OF EDUCATION	-0.011	-0.080	-0.125	-0.054	-0.115	0.158	-0.131
PERCENT WITH 09-11 YEARS OF EDUCATION	0.166	-0.053	0.037	0.002	0.127	-0.278*	0.050
PERCENT WITH 12 YEARS OF EDUCATION	-0.084	0.074	0.146	0.102	-0.054	-0.048	0.105
PERCENT WITH 13-15 YEARS OF EDUCATION	-0.172	0.134	0.168	0.212	0.114	-0.078	0.002
PERCENT WITH 16 YEARS OF EDUCATION	-0.006	0.049	-0.073	-0.132	-0.023	0.060	-0.009
PERCENT WITH 17-++ YEARS OF EDUCATION	-0.028	-0.043	0.056	-0.007	0.077	0.050	-0.074
PERCENT WHO WORKED 01-14 HOURS	-0.124	-0.187	-0.053	-0.065	0.415*	-0.034	-0.145
PERCENT WHO WORKED 15-29 HOURS	-0.186	-0.032	-0.358*	0.067	0.247	-0.264*	-0.098
PERCENT WHO WORKED 30-34 HOURS	0.100	-0.118	-0.439*	0.058	0.056	-0.091	-0.128
PERCENT WHO WORKED 35-39 HOURS	0.175	0.046	-0.210	-0.227	0.080	-0.033	-0.075
PERCENT WHO WORKED 40 HOURS	-0.109	-0.011	0.294*	-0.087	-0.157	0.131	0.296*
PERCENT WHO WORKED 41-48 HOURS	0.133	-0.001	0.033	0.084	0.075	-0.096	-0.004
PERCENT WHO WORKED 49-59 HOURS	0.003	0.043	-0.100	0.133	0.028	-0.088	-0.011
PERCENT WHO WORKED 60-++ HOURS	-0.004	-0.032	0.052	0.105	-0.066	0.111	0.048
PERCENT WHO WORKED 01-13 WEEKS	0.081	0.138	0.025	-0.017	0.489*	-0.059	-0.021
PERCENT WHO WORKED 14-29 WEEKS	-0.344*	-0.088	-0.028	0.213	0.092	-0.158	0.138
PERCENT WHO WORKED 27-39 WEEKS	-0.250*	0.065	-0.072	0.004	0.043	0.125	0.216
PERCENT WHO WORKED 40-47 WEEKS	0.050	-0.120	-0.189	0.019	-0.003	0.005	-0.005
PERCENT WHO WORKED 48-49 WEEKS	0.038	0.074	-0.261*	0.095	0.070	-0.010	-0.206
PERCENT WHO WORKED 50-52 WEEKS	0.102	-0.014	0.240	-0.109	-0.200	0.004	-0.024
PERCENT IN AGRICULTURE, FORESTRY, AND FISHERIES	0.003	-0.113	-0.073	0.020	-0.034	0.055	-0.048
PERCENT IN MINING	0.199	0.064	0.232	0.058	-0.016	0.624**	0.024
PERCENT IN CONSTRUCTION	0.110	0.031	-0.087	0.078	-0.110	0.053	0.560**
PERCENT IN MANUFACTURING-DURABLE GOODS	-0.006	-0.286*	-0.028	-0.194	-0.009	-0.110	0.029
PERCENT IN MANUFACTURING-NONDURABLE GOODS	0.052	-0.016	-0.042	-0.514**	-0.003	-0.138	0.044
PERCENT IN TRAN., COMM., & OTHER PUBLIC UTILITIES	0.052	0.761**	0.149	0.018	-0.072	0.199	0.036
PERCENT IN WHOLESALE TRADE	0.020	0.671**	-0.078	0.042	0.120	-0.111	-0.065
PERCENT IN RETAIL TRADE	0.134	0.253*	-0.144	0.602**	0.138	-0.075	0.130
PERCENT IN FINANCE, INSURANCE, AND REAL ESTATE	-0.060	0.399*	0.017	0.223	0.033	-0.194	-0.063
PERCENT IN BUSINESS & REPAIR SERVICES	0.046	0.296*	-0.067	0.200	-0.101	-0.084	-0.057

TABLE B-3 CONTINUED

ROTATED FACTOR MATRIX

REGIONAL CHARACTERISTIC	FACTOR 8	9	10	11	12	13	14
PERCENT IN PERSONAL SERVICES	-0.155	0.079	0.206	0.207	-0.089	0.077	0.069
PERCENT IN ENTERTAINMENT & RECREATION SERVICES	0.026	-0.042	0.081	0.552**	-0.022	-0.033	-0.044
PERCENT IN PROFESSIONAL & RELATED SERVICES	-0.224	-0.158	0.089	0.036	0.284*	0.261*	-0.077
PERCENT IN PUBLIC ADMINISTRATION	-0.027	0.120	0.058	0.247	0.046	-0.017	0.068
PERCENT PROFESSIONAL,TECH., & KINDRED WORKERS	-0.010	-0.084	0.027	-0.028	0.086	0.081	-0.009
PERCENT MANAGERS & ADMINISTRATORS	0.166	0.266*	-0.095	0.118	-0.183	-0.136	0.168
PERCENT SALES WORKERS	0.145	0.332*	-0.182	0.276*	0.110	-0.099	0.099
PERCENT CLERICAL & KINDRED WORKERS	-0.133	0.270*	0.069	0.135	0.119	-0.093	-0.075
PERCENT CRAFTSMEN & KINDRED WORKERS	0.280*	-0.078	0.036	0.011	-0.029	-0.013	0.437*
PERCENT OPERATIVES, EXCEPT TRANSPORT	0.017	-0.248	0.064	-0.364*	0.014	-0.024	-0.032
PERCENT TRANSPORT EQUIPMENT OPERATIVES	0.026	0.358*	0.010	-0.075	-0.018	0.282*	0.084
PERCENT LABORERS, EXCEPT FARM	-0.028	0.101	0.179	-0.029	0.012	0.112	0.334*
PERCENT FARMERS & FARM MANAGERS	-0.072	-0.145	-0.075	-0.069	0.017	0.066	-0.099
PERCENT FARM LABORERS & FARM FOREMAN	0.032	-0.157	-0.051	0.030	-0.008	0.022	-0.039
PERCENT SERVICE WORKERS, EXC. PRIVATE HOUSEHOLD	-0.145	-0.025	0.200	0.479*	0.086	0.138	-0.140
PERCENT PRIVATE HOUSEHOLD WORKERS	-0.103	-0.008	0.087	-0.010	-0.055	0.124	0.087
PERCENT WHO EARNED 00000-00099 DOLLARS	0.029	0.139	-0.087	-0.066	0.325*	-0.102	-0.138
PERCENT WHO EARNED 00100-00999 DOLLARS	-0.163	-0.039	-0.146	0.036	0.238	0.037	0.000
PERCENT WHO EARNED 01000-01999 DOLLARS	-0.182	-0.080	-0.156	0.099	0.196	0.026	0.105
PERCENT WHO EARNED 02000-02999 DOLLARS	-0.164	-0.021	-0.116	0.098	0.020	0.082	0.083
PERCENT WHO EARNED 03000-03999 DOLLARS	-0.151	-0.029	0.045	-0.016	0.023	0.091	0.092
PERCENT WHO EARNED 04000-04999 DOLLARS	-0.149	-0.025	0.145	-0.042	-0.050	0.003	0.025
PERCENT WHO EARNED 05000-05999 DOLLARS	-0.034	0.045	0.353*	-0.145	-0.163	-0.057	-0.044
PERCENT WHO EARNED 06000-06999 DOLLARS	-0.064	0.015	0.654**	0.055	-0.038	0.135	-0.084
PERCENT WHO EARNED 07000-07999 DOLLARS	0.055	0.029	0.452*	0.155	-0.021	0.150	-0.067
PERCENT WHO EARNED 08000-09999 DOLLARS	0.075	0.066	0.134	0.101	0.052	0.043	-0.015
PERCENT WHO EARNED 10000-11999 DOLLARS	0.173	0.048	-0.106	0.057	-0.019	-0.098	-0.002
PERCENT WHO EARNED 12000-14999 DOLLARS	0.137	0.056	-0.095	0.043	-0.002	-0.100	-0.031
PERCENT WHO EARNED 15000-25999 DOLLARS	0.082	0.011	-0.142	0.029	-0.043	-0.093	-0.043
PERCENT WHO EARNED 26000-34999 DOLLARS	0.087	0.019	-0.238	-0.024	-0.009	-0.021	0.004
PERCENT WHO EARNED 35000-+++++ DOLLARS	0.108	0.063	-0.232	0.010	-0.087	0.083	-0.079
PERCENT UNEMPLOYED	0.116	0.055	0.180	-0.029	-0.135	0.030	-0.034
VARIANCE	2.830	2.290	2.270	2.200	1.990	1.730	1.620
PERCENT VARIANCE	4.640	3.750	3.730	3.610	3.260	2.840	2.660

NOTE: ** IS USED TO SIGNIFY LOADINGS GREATER IN ABSOLUTE VALUE THEN .50, WHILE * IS USED TO SIGNIFY LOADINGS GREATER IN ABSOLUTE VALUE THEN .25 BUT LESS THEN .50

squared factor loadings is a maximum. In matrix notation, this amounts to,

$$B = A\ T$$

This facilitates interpretation of factor dimensions by attempting to force the factor loadings to a value of zero or one. The transformed laoding b_{kj} can be interpreted as the standardized regression coefficient for predicting the kth variable from the jth transformed factor.[5]

The factor score matrix which corresponds to the rotated factor matrix is given in Table B-4. Each of the fourteen dimensions will be briefly described in the remainder of this section. As an aid to interpretation, the county groups are geographically defined in Figure B-1. Since regional structure is not the topic of this dissertation, an attempt will be made to keep the description short. The content of each dimension is given a label which attempts to capture the basic character of the dimension.

Factor 1: Human capital / White collar workers

County groups scoring high on this factor are characterized by residents that have high levels of education

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[5]For a detailed discussion of the varimax method of rotation, see, Harry Harman, Modern Factor Analysis (Chicago: The University of Chicago Press, 1967), pp. 304-313.

TABLE B-4

ROTATED FACTOR SCORE MATRIX

COUNTY GROUP CODE	FACTOR 1	2	3	4	5	6	7	8	9	10	11	12	13	14
00101	-0.432	0.865	1.152	-1.220	-0.199	1.071	1.444	0.194	0.984	1.368	-0.143	1.187	-0.149	1.325
00201	-0.081	-0.180	0.774	-0.855	1.313	-0.187	0.583	-0.432	1.375	0.222	-0.582	0.652	-0.609	1.369
00202	-0.104	-0.186	1.326	-1.800	0.653	0.061	1.147	-0.437	-1.707	1.365	-0.595	-0.799	-0.469	1.239
00301	0.508	0.943	0.361	-0.726	0.331	-0.141	1.493	-0.436	-0.401	1.720	-1.279	0.748	0.419	-0.065
00401	-1.055	-1.318	1.486	-1.435	0.734	1.003	-0.137	0.946	-0.544	-0.903	-1.062	0.286	-1.034	-0.575
00402	0.598	-1.388	0.491	-1.218	1.275	0.673	0.007	-0.032	-0.451	0.154	-0.800	0.532	-0.605	0.898
00403	1.797	-0.720	0.250	-0.937	0.377	0.608	0.248	-0.641	-0.248	-0.441	-1.584	0.473	-0.366	-0.149
00404	2.221	-0.635	0.154	-1.195	1.319	0.130	1.042	0.147	0.232	-0.536	-0.420	0.335	-0.575	1.283
00405	0.628	-0.212	0.331	-0.870	-0.042	1.100	0.553	1.095	0.510	-0.369	0.051	-0.313	-0.993	1.647
00406	0.140	-2.387	1.332	-0.516	1.822	1.407	-0.934	-2.460	0.449	0.954	0.672	1.682	-0.927	-0.805
00407	0.121	-0.864	0.538	-0.969	0.920	0.785	0.798	0.595	-0.538	0.208	-0.977	1.032	-1.164	-1.184
00408	0.617	-0.321	0.655	-1.356	0.609	-0.503	1.119	-0.503	-1.034	1.262	-0.336	-1.102	-1.080	1.627
00409	-0.155	-1.774	1.357	-1.146	0.892	0.847	0.001	0.168	-1.422	-0.011	0.276	0.106	-1.497	0.344
00410	0.664	-0.138	0.256	0.002	1.246	0.331	-0.436	0.768	-2.055	0.163	1.804	0.158	-1.669	0.332
00501	0.795	-1.392	0.035	-0.483	0.452	0.201	0.832	0.595	-1.733	-0.572	0.155	-0.403	-0.957	0.428
00502	0.604	-0.684	-0.204	-0.814	0.250	0.723	0.959	0.880	-2.331	-0.612	-0.297	-0.483	-0.827	-0.309
00503	0.393	-1.087	-0.360	-0.233	0.701	0.593	0.230	0.487	-0.869	-0.947	-0.831	-0.275	-0.913	-0.599
00504	-0.358	-1.030	0.095	-1.191	0.139	-0.158	-0.749	-0.114	-1.243	-1.093	0.011	0.751	0.016	0.140
00505	-0.119	-1.373	0.078	-0.602	1.296	0.325	-0.292	0.602	-0.257	-0.396	-0.685	1.079	-1.577	0.590
00506	0.529	-0.235	0.281	-1.147	1.211	0.827	0.741	-0.862	-2.299	1.184	-1.195	1.882	-0.157	1.172
00601	0.917	-1.446	0.662	-1.003	1.794	-0.693	-1.152	-0.366	0.517	-0.234	-0.603	0.219	-0.528	0.348
00602	0.750	-1.198	0.577	-0.689	0.717	0.345	-0.274	1.532	-0.646	0.613	-0.388	1.410	0.323	0.065
00603	0.559	-0.185	1.141	-1.046	1.300	1.327	0.266	1.257	-1.097	1.693	-1.413	0.020	0.096	0.787
00604	0.800	-0.034	0.471	-0.483	0.847	0.625	0.723	0.891	-1.910	2.136	-0.615	0.321	-0.353	-0.079
00701	0.583	-0.586	-0.823	0.183	-0.232	0.733	0.361	0.161	-1.479	-0.896	-0.843	1.155	-0.117	-0.800
00702	0.534	-0.670	-0.100	-0.412	0.867	1.222	0.231	0.251	0.164	0.297	-0.525	0.789	-0.583	-0.087
00703	-0.144	-1.043	0.035	-0.316	1.517	0.008	-0.427	1.425	-1.618	1.047	-0.169	-1.511	0.882	-0.518
00704	-0.164	0.537	0.315	-1.105	0.139	-0.165	-0.993	1.347	-1.398	1.606	0.267	0.649	0.740	0.204
00705	0.912	-0.166	0.024	-0.369	0.811	0.339	-0.249	-0.419	-2.298	1.617	-1.092	0.434	0.221	0.208
00801	-0.328	-1.098	-0.925	0.240	0.533	-0.041	-0.950	0.594	-0.343	-0.287	0.187	0.410	-0.283	-0.932
00802	-0.586	-0.092	-0.764	-0.383	1.445	0.004	0.051	0.032	-1.872	1.894	0.952	-0.252	0.163	0.091
00901	-0.282	-0.333	-0.594	-0.716	-0.179	-0.057	-0.044	0.411	0.297	1.320	-1.249	-0.150	-0.847	0.489
00902	-1.289	-1.169	-3.000	1.255	0.412	0.211	0.957	0.335	-0.785	-0.335	1.492	-0.234	1.048	-0.019
00903	-1.121	-0.182	-2.142	0.338	0.877	-0.698	-0.065	0.031	-0.760	1.884	-0.244	1.171	0.259	1.516
01001	-0.254	-0.345	0.248	-1.243	-0.117	0.174	-0.066	-0.014	-1.358	1.116	-1.357	0.794	1.745	1.064
01101	0.612	-0.157	-0.287	-0.917	-0.014	-1.030	-0.409	-0.594	-1.298	1.727	-1.167	-2.531	-0.453	0.583
01102	-0.197	0.107	-0.548	-0.400	0.984	-0.314	-0.032	-0.014	-0.816	1.468	-0.722	0.026	0.619	0.910
01201	-1.480	-2.079	1.998	-1.756	1.518	0.775	-0.473	0.476	0.441	-0.829	0.023	0.568	-0.071	0.135
01202	-0.683	-1.299	1.481	-1.855	1.297	0.272	-1.194	0.762	-0.225	0.289	-0.836	-0.856	0.282	0.234
01301	-0.527	-2.553	0.436	0.567	1.290	0.643	-1.197	-0.506	2.488	0.625	-0.256	-1.004	0.176	-2.681
01302	2.599	-2.262	1.308	0.706	1.687	1.805	-0.251	-0.948	-0.115	0.203	-0.408	-3.308	1.946	-3.870
01303	0.339	-2.544	-0.056	0.159	1.846	-0.308	-1.276	0.435	1.804	0.193	0.049	-1.641	-0.404	-1.927
01304	-0.142	-2.137	-0.429	-1.015	-0.408	-0.833	-2.678	-0.195	1.733	-0.410	-0.604	0.112	-0.389	-0.036
01305	-0.772	-2.647	0.408	0.817	0.912	0.207	-1.513	-0.583	2.209	0.698	0.280	-0.272	0.400	-3.349
01306	2.357	-0.998	-0.159	0.045	1.329	-0.829	0.100	2.546	0.581	-1.600	-0.470	0.261	-0.565	1.100
01307	0.531	-0.763	-0.659	-0.408	-1.114	-0.209	-0.908	1.693	0.258	-2.046	0.652	0.108	1.061	-0.087
01308	2.728	-1.087	0.460	0.247	1.285	-0.151	0.690	1.338	-0.201	-1.346	-0.510	-1.042	1.035	-0.346
01309	-0.110	-0.220	-0.320	0.059	0.210	-0.392	-0.923	0.484	0.055	0.046	0.264	-0.931	0.130	-0.670
01310	1.574	0.180	-1.459	0.199	-0.509	-1.488	-0.456	-0.056	-1.753	0.092	-1.488	-1.607	1.211	-1.951
01311	1.922	-0.892	0.039	0.209	1.586	-0.046	1.546	1.749	-0.801	-0.906	-0.964	-0.866	-0.204	-0.314
01312	-1.880	-3.113	0.590	-0.540	0.549	0.595	-1.523	-0.114	2.363	0.438	0.202	-0.508	-0.909	-1.906

TABLE B-4 CONTINUED

ROTATED FACTOR SCORE MATRIX

COUNTY GROUP CODE	FACTOR 1	2	3	4	5	6	7	8	9	10	11	12	13	14
01313	1.802	-1.070	0.056	-0.533	1.256	-0.544	0.360	2.692	0.783	-1.748	-1.121	0.634	-0.827	0.650
01314	-0.250	-1.496	0.037	-0.108	0.718	-0.361	-0.105	0.519	0.555	-1.015	-0.556	-0.723	-0.728	-0.317
01315	0.632	-1.831	0.094	1.205	1.795	0.665	0.017	0.466	0.501	-0.160	-0.661	-0.249	-0.146	-1.185
01316	2.261	-0.415	-0.049	-0.690	-0.813	-1.204	0.434	1.723	-0.532	-1.669	-2.625	-1.633	0.354	-0.898
01317	0.969	-1.437	-0.397	0.242	1.233	0.131	0.065	1.716	0.338	-1.239	-1.471	-0.373	-0.763	0.433
01318	0.866	-0.638	-0.139	-0.635	-0.401	-0.453	0.231	2.713	-0.473	-0.926	-1.330	-0.143	0.765	-1.171
01319	-0.183	-1.616	-0.405	-0.963	-0.865	0.107	-0.607	1.203	0.641	-1.395	-1.407	0.887	-0.207	0.591
01320	1.305	-0.181	-0.845	0.317	0.243	-0.292	-0.323	1.894	1.263	-2.384	-0.813	-0.573	0.194	0.343
01401	0.938	-1.458	0.372	0.240	0.643	0.219	-1.307	2.329	-1.629	-0.103	-0.987	-0.151	0.885	-0.204
01402	-0.876	-1.390	0.594	-1.334	0.050	-0.029	-0.245	0.877	1.062	-2.458	2.521	-1.120	0.306	2.623
01403	-0.559	-1.325	0.858	0.339	1.593	1.886	-0.302	1.170	-0.878	-0.752	1.773	-1.123	-0.114	-0.159
01404	0.109	-0.641	-0.249	-0.604	-1.270	-0.772	-1.006	1.443	0.728	-1.727	-0.238	0.956	-0.476	0.278
01405	-0.156	-1.133	-0.186	-0.206	0.368	-0.182	-0.930	1.128	0.826	-1.051	-0.939	0.337	-1.741	0.746
01406	-0.873	-2.083	0.017	1.504	1.248	-0.109	-1.367	-0.175	0.288	0.366	0.505	0.677	-1.251	-1.409
01407	0.092	-0.765	-0.502	-0.988	-1.241	-0.483	0.492	1.178	-0.478	-0.739	-0.541	0.563	-0.858	0.529
01408	1.952	-0.555	-0.335	0.246	1.039	-1.034	1.465	1.102	-0.545	-0.334	-1.613	-0.586	0.010	-0.199
01409	1.460	-0.193	-0.317	0.232	0.252	0.071	1.452	1.146	-1.309	-0.197	-2.027	0.663	0.652	0.460
01410	1.234	-1.735	0.115	-0.181	1.205	-0.891	0.226	1.179	-0.543	-0.409	-0.105	0.307	-0.401	0.452
01411	0.432	-0.676	-0.564	0.832	-0.086	-1.057	-0.451	0.600	-0.783	-0.819	-0.414	-0.652	-0.055	-0.258
01412	-1.395	-1.216	0.616	-0.677	0.902	-0.030	0.334	1.331	-0.686	0.385	-0.048	1.569	-0.336	-1.745
01413	-0.455	-1.169	0.044	-0.767	0.782	-0.351	-0.150	0.622	-0.317	-0.656	0.157	0.393	-0.824	0.500
01414	-1.341	-1.344	-0.041	-0.789	0.652	-0.136	-0.033	1.185	-1.708	-0.391	-0.879	-0.383	0.318	0.112
01415	-2.193	-1.502	1.856	-2.411	0.803	0.021	-2.155	0.775	-0.651	1.240	-1.322	-1.477	-0.050	1.262
01501	-0.255	-0.874	0.243	-0.784	0.456	-1.283	-1.014	-0.001	1.198	0.578	-0.762	0.930	-0.942	0.733
01502	-0.689	-0.124	0.486	-0.945	0.045	-0.678	2.047	0.119	-0.767	-0.173	-0.222	0.273	-0.103	-1.022
01503	-1.151	-0.552	-0.012	-1.090	0.306	-1.555	1.525	0.944	0.275	-0.100	0.015	-0.630	-0.413	-0.502
01504	-1.624	-0.478	0.750	-1.547	-0.186	-0.943	-0.565	0.439	0.912	0.118	0.092	0.178	0.678	-0.455
01505	-2.235	-0.743	0.615	-1.503	0.572	-0.864	-0.539	0.532	0.093	0.879	-0.476	1.010	0.439	0.057
01601	-1.079	-1.696	-0.224	2.308	1.069	0.204	-1.640	-0.422	-0.158	0.138	1.205	0.938	-0.318	-1.570
01602	0.545	-1.260	-0.372	-0.264	-0.028	-2.102	-0.214	2.420	-0.035	-0.796	0.127	-0.041	-0.360	0.467
01603	0.310	-0.374	-0.458	0.263	-1.438	-1.539	-0.973	1.560	-0.228	-0.367	-0.350	0.166	0.401	-0.070
01604	0.977	-1.459	-0.707	2.727	0.748	0.001	-2.136	-2.325	-1.321	1.810	0.456	-2.241	1.525	-2.101
01605	3.301	-0.084	-0.260	0.295	-0.274	-2.314	-0.564	1.283	-1.786	-0.738	-0.908	-0.394	-0.031	-0.560
01606	1.176	-1.212	-0.135	-0.418	-2.394	-1.620	-1.760	-1.615	-0.345	-0.045	0.276	0.570	0.066	-0.202
01607	2.815	-1.770	0.846	-0.421	-0.215	-1.114	-0.635	-2.643	-0.589	1.867	-0.788	-1.403	-1.311	0.189
01608	2.711	0.189	-0.202	0.022	-2.022	-1.579	-0.899	0.961	-1.215	-0.925	-0.286	-0.299	-0.395	0.267
01609	-0.914	0.479	-0.334	0.559	-0.963	-2.231	-1.995	0.012	-0.028	-0.216	0.398	0.174	-0.494	1.140
01610	-0.417	0.499	0.478	1.143	0.719	-0.261	-0.339	-0.057	0.340	-1.314	-0.779	-1.793	-1.601	1.697
01701	-0.640	-0.169	1.457	-0.038	0.030	0.005	0.360	-0.630	-0.657	-0.006	0.039	0.560	0.696	0.921
01801	-1.193	0.010	1.292	1.161	-0.397	-0.808	-0.071	-0.312	-1.108	-0.721	-1.355	-0.345	-0.562	0.141
01802	-0.562	-0.399	1.204	0.183	-0.913	-1.104	0.150	-0.734	0.101	1.562	-1.036	0.049	0.546	-0.238
01901	0.706	-1.187	1.267	0.793	-0.163	-1.433	0.243	-0.377	0.958	0.150	-0.077	0.261	-0.253	0.095
01902	-0.240	0.040	0.635	1.955	0.423	-0.761	-1.341	0.156	-1.767	-0.771	-0.455	0.389	0.710	0.553
02001	0.318	-0.855	-0.401	1.476	-0.685	-0.800	-1.495	0.630	-1.433	0.457	0.946	1.098	-0.915	1.639
02002	0.069	-0.634	0.418	1.482	1.036	-0.092	-1.392	-0.092	0.861	-0.405	1.891	1.803	-0.046	1.119
02003	-0.651	-0.428	-0.372	1.156	-1.324	-0.995	-0.736	0.604	0.303	-0.376	1.333	0.728	-1.252	1.375
02004	-0.918	1.362	-0.484	3.012	0.655	0.272	-1.638	-0.104	-0.119	-0.209	-1.359	-0.353	-1.729	0.484
02101	1.732	-0.058	1.058	1.209	-0.847	-0.421	0.520	-0.398	-0.662	0.627	-0.979	3.071	1.447	-0.864
02102	-0.714	1.114	1.449	1.912	-0.262	0.358	-0.245	0.121	-0.973	-0.303	-1.097	-0.034	-1.758	-0.669
02103	-0.800	1.302	1.390	1.579	0.033	1.227	0.108	0.364	-0.751	-1.300	0.067	1.120	-0.219	-1.142
02104	-0.871	0.635	2.445	0.497	-2.072	1.000	-0.587	-0.520	-0.382	0.384	-0.175	0.657	-2.804	-0.682

TABLE B-4 CONTINUED

ROTATED FACTOR SCORE MATRIX

COUNTY GROUP CODE	FACTOR 1	2	3	4	5	6	7	8	9	10	11	12	13	14
02201	-0.572	0.689	0.988	1.022	-0.091	0.893	-0.168	-0.098	0.026	-0.877	-0.345	1.054	-1.553	2.420
02301	0.317	-0.484	1.201	1.089	-0.163	-0.313	2.522	0.066	0.697	-0.106	-0.549	0.108	-0.861	-0.986
02302	-0.648	-1.032	1.799	-0.046	-1.261	-0.006	1.119	0.736	-0.214	0.943	-1.621	1.156	-0.356	-1.684
02303	-1.985	-1.019	2.436	-0.438	-0.779	1.018	0.557	0.008	-1.035	-0.968	-0.910	-1.233	0.156	0.194
02304	-1.444	-0.726	2.471	0.090	-0.989	0.100	1.395	1.395	-1.465	0.633	-0.404	0.121	-1.532	-1.385
02401	0.607	-0.560	1.176	0.876	-1.283	0.112	2.661	-0.632	1.735	0.412	-0.113	0.056	0.261	-0.643
02402	-1.320	-0.657	1.945	-0.093	-1.659	-0.779	2.261	0.042	-1.078	0.922	-0.869	-0.222	-0.891	-0.327
02403	-2.036	-0.845	2.182	0.378	-0.430	-0.244	1.399	1.238	0.378	0.681	-1.052	1.123	-0.883	-1.352
02404	-1.863	-1.175	2.546	0.022	-1.732	0.091	2.066	0.782	-0.793	0.361	0.279	0.413	-0.449	-1.333
02501	-0.793	-0.309	1.795	0.001	-0.993	0.330	-0.392	0.301	-0.783	1.204	-0.853	-1.259	-0.335	0.614
02601	0.068	-0.293	1.466	0.242	-1.547	-0.654	2.090	0.118	-0.578	1.731	-0.822	0.216	-1.414	0.530
02602	-1.005	-0.301	1.586	0.889	-1.329	-1.122	2.342	0.496	-0.960	2.223	-0.862	0.106	-0.897	-0.575
02701	0.998	-0.887	1.678	0.446	-1.502	-2.064	-0.437	-0.702	-0.460	-0.092	0.988	0.325	0.845	0.456
02702	-0.878	1.164	0.534	2.661	-0.311	-0.203	-0.308	0.087	-1.035	-0.891	-0.939	0.944	-2.320	0.336
02801	-0.933	0.803	1.223	1.900	-1.474	-0.231	0.776	-0.178	-1.087	-1.231	-0.209	0.437	-0.529	0.020
02901	0.449	-0.655	0.805	1.821	-0.721	-2.339	0.335	-0.180	-1.279	0.450	1.096	-0.549	0.313	0.815
02902	-0.024	-0.584	0.054	1.457	-0.446	-1.582	-0.452	-0.649	0.228	-0.574	0.478	0.140	-0.242	1.559
02903	-1.185	1.017	0.965	2.574	-0.761	-1.092	-0.145	0.000	-1.021	-0.384	-1.228	0.843	-1.343	0.375
03001	-0.606	0.981	0.041	1.895	-0.057	-0.362	-0.529	0.033	0.499	-0.312	-0.793	-0.317	-1.263	-0.126
03101	0.193	-0.986	0.928	0.910	0.037	-0.316	0.475	1.129	2.237	-0.184	2.313	0.835	0.039	1.405
03102	1.640	0.755	0.954	1.189	-0.072	1.324	0.433	-0.558	-2.309	0.745	0.857	1.043	0.628	-0.042
03103	-0.475	1.113	0.355	1.286	-0.376	0.413	-0.333	0.697	0.785	0.982	-0.671	0.885	-0.066	-0.698
03201	0.881	0.015	0.564	0.843	0.194	0.737	1.394	1.200	0.387	-0.560	2.106	-0.059	-1.001	1.673
03202	0.900	0.226	-1.310	0.648	-2.346	-0.992	-1.119	-0.381	-1.788	-0.382	1.247	-2.155	-1.084	1.007
03203	0.921	1.133	0.425	1.433	0.960	0.469	0.646	0.175	0.635	-0.883	1.973	-0.171	0.258	1.128
03301	1.164	-0.222	0.853	0.600	0.895	1.402	2.240	0.304	0.767	-0.796	3.128	-1.755	-0.456	1.589
03302	0.965	-0.537	1.050	0.632	0.754	1.782	1.399	0.160	1.477	-0.315	1.562	-1.130	0.204	0.244
03303	0.157	-0.074	0.623	0.461	-0.135	0.839	2.142	-0.296	2.024	0.096	0.854	0.107	0.939	0.622
03304	1.278	-0.067	0.773	0.888	2.713	1.150	2.193	0.395	0.206	0.453	2.305	-0.303	-1.794	1.908
03305	1.203	0.472	0.494	1.052	0.737	1.972	1.466	-0.004	-0.220	-1.191	1.372	-1.407	-0.664	1.748
03306	-0.158	0.420	1.007	0.525	-0.087	0.819	1.373	0.379	0.646	0.379	1.429	-1.587	1.351	1.105
03307	0.579	0.444	0.759	0.703	1.049	0.404	0.872	-0.576	0.100	-0.292	2.636	-0.839	-0.473	2.122
03308	0.164	0.567	1.102	0.999	-0.147	1.846	1.324	-0.331	-0.898	-1.080	3.425	-1.867	-0.818	1.558
03401	0.774	0.952	0.339	1.927	0.096	0.238	-0.517	-1.205	-0.683	-0.288	-0.641	0.693	1.159	-0.171
03501	-0.465	-0.156	0.650	0.509	-1.223	-0.196	-1.257	0.665	0.593	0.166	0.633	0.752	0.027	0.163
03601	0.148	0.750	-0.246	2.719	0.596	-1.185	-0.246	-1.092	0.591	0.346	-1.207	-0.708	-0.013	0.346
03602	-0.664	0.614	1.442	1.179	-0.062	-0.557	-0.525	-0.174	0.158	-0.292	-1.231	-0.208	-1.239	0.742
03701	-0.628	1.493	0.861	2.269	-0.302	-0.784	0.226	0.667	-0.219	-0.984	-0.215	1.488	-0.385	-0.957
03801	-0.675	0.326	0.383	2.715	-0.122	-1.635	-1.336	-0.032	-0.696	-0.525	-0.213	0.439	0.171	-0.739
03901	0.043	0.162	1.178	2.138	0.118	-2.010	0.131	-0.327	-0.777	0.826	-0.984	0.511	-1.157	-0.795
04001	2.074	-0.772	0.533	0.416	-1.315	-1.257	1.549	-0.514	1.739	0.055	-0.310	-0.020	0.741	-0.366
04002	1.043	-0.847	0.307	1.984	0.311	-0.174	0.829	-1.855	1.938	0.017	0.328	-0.020	0.417	-0.227
04003	-1.286	-1.064	0.172	-0.700	-3.197	-0.663	0.305	-0.520	2.412	-0.666	0.525	-1.028	-1.043	0.112
04004	-0.253	0.093	1.749	0.565	-1.252	-0.669	0.818	-1.321	-1.070	0.070	-1.387	0.030	0.317	0.276
04005	-1.852	-0.853	2.179	-0.089	-1.305	-1.288	0.680	0.631	-1.095	0.625	0.382	-0.107	0.069	-0.160
04006	-2.048	0.032	0.771	1.433	-0.774	-0.375	-0.009	-0.760	0.709	0.363	-0.790	-0.559	-2.755	-0.062
04101	0.267	-0.289	-0.756	1.943	0.417	-0.394	1.098	0.002	0.869	0.806	0.157	-0.200	1.303	0.465
04102	-1.012	0.262	0.068	1.153	-0.295	-0.705	0.499	0.370	0.223	0.803	-0.082	0.842	0.192	0.649
04103	-0.420	0.635	1.492	0.776	0.214	0.427	0.208	-1.294	-0.425	-1.285	-2.361	-0.176	-0.173	0.436
04104	-1.525	0.530	0.224	1.541	-0.044	1.105	-1.530	0.032	-0.605	-1.745	-1.504	0.263	-0.285	0.538
04201	0.279	-0.261	0.110	1.758	0.126	0.318	0.191	-0.470	1.967	-0.579	-0.078	-0.161	-0.272	-0.459

TABLE B-4 CONTINUED

ROTATED FACTOR SCORE MATRIX

COUNTY GROUP CODE	FACTOR 1	2	3	4	5	6	7	8	9	10	11	12	13	14
04202	-0.937	1.017	1.798	0.434	-0.457	2.701	0.106	-0.037	-1.037	-2.094	-0.620	0.110	-0.571	-1.248
04203	-1.557	0.282	1.366	0.484	0.955	0.757	0.689	-0.214	0.098	-0.357	-1.140	-0.921	-0.507	0.380
04204	-0.978	1.723	0.183	2.162	0.409	1.205	0.035	-1.178	0.145	-1.883	-1.562	-0.712	0.547	-0.740
04301	-1.451	0.229	-0.062	0.709	-0.507	0.849	-0.324	-0.083	0.755	-1.432	-1.206	-1.430	0.553	0.908
04302	0.526	0.963	-0.137	0.611	-2.132	-1.821	-1.409	-0.867	-1.174	-0.274	-1.038	-1.408	-0.528	0.397
04401	0.219	-0.819	0.286	0.503	-0.058	-2.100	0.708	-1.448	0.428	1.216	-1.324	-1.636	0.191	1.302
04402	-1.750	-0.214	1.718	-1.121	-2.082	-0.044	0.780	-0.504	-0.233	0.932	-0.721	-1.983	-0.119	-0.479
04501	0.172	-0.672	1.058	0.116	-0.553	-0.817	0.630	-1.350	0.999	0.467	0.588	-0.633	0.672	-0.887
04502	-0.508	-0.029	0.727	0.386	0.224	-0.316	-0.640	-0.301	-0.499	-1.036	0.109	-2.934	1.548	-0.184
04503	-1.115	-0.173	2.641	-1.351	-0.540	0.608	-0.431	-1.350	-1.186	-3.720	-0.174	-0.551	1.674	-0.005
04504	-1.243	-0.329	1.600	-0.435	-0.470	-0.579	0.013	-1.607	-0.177	-1.343	-0.208	-1.330	0.136	1.686
04601	0.834	-0.483	0.428	0.266	0.159	-0.214	0.351	-0.628	0.112	0.977	-0.657	-0.742	1.519	1.901
04602	-1.928	-0.156	2.150	-1.171	-0.627	1.463	-0.338	-0.193	0.040	-1.577	-0.063	-1.336	1.181	0.703
04701	-0.825	-0.081	0.903	-1.091	-1.803	0.036	-0.160	-0.093	-0.503	1.379	-2.362	-0.932	0.966	1.092
04702	-1.223	-0.083	0.710	0.340	-0.678	-0.298	0.190	1.356	0.179	0.613	0.006	0.374	2.351	-0.006
04801	-0.243	-0.228	-0.074	-0.371	-0.833	0.532	-0.519	-0.129	0.869	1.150	-0.732	-0.687	0.962	1.083
04802	0.160	-1.190	-0.182	-0.094	0.201	-0.474	-0.468	-0.010	1.726	0.497	0.494	-1.029	3.156	2.248
04803	-1.127	-0.251	0.038	-0.195	0.285	1.705	0.728	1.333	-0.013	1.507	0.001	-0.374	3.643	1.246
04804	-1.496	-0.330	0.072	-0.362	-0.150	0.707	-0.123	0.719	0.617	-0.564	0.725	0.598	4.265	1.828
04901	0.581	0.138	0.661	-0.071	-0.450	-0.283	-0.124	-2.054	-1.535	-0.222	-0.012	0.059	0.742	-0.199
04902	-1.094	0.205	2.470	-1.012	-0.854	0.997	0.296	0.729	-0.120	-2.877	-0.147	-0.928	4.370	-0.104
05001	-0.347	-1.400	-0.046	0.385	0.046	-0.238	1.140	-0.567	0.713	-0.204	0.262	-0.406	0.759	-0.044
05002	-1.675	0.724	0.136	-0.298	-0.152	0.730	0.656	-0.780	-0.894	-0.528	0.541	-1.446	0.884	-0.284
05101	-0.406	-0.270	-0.334	-0.278	0.113	-0.855	0.908	-1.629	0.516	1.027	-0.177	-0.593	0.467	1.133
05102	-0.963	0.987	-0.163	-0.604	0.328	-0.443	0.660	1.177	-0.240	0.279	0.066	-0.306	1.603	-0.135
05201	-0.568	0.123	-0.353	-0.700	0.713	-0.178	0.479	-1.219	0.648	0.110	-0.902	1.071	0.768	1.278
05301	0.044	0.065	-0.171	-0.282	0.885	-0.595	0.446	-0.221	0.540	-0.046	0.567	0.438	0.496	-0.216
05401	0.624	-0.108	-0.007	-0.439	0.321	1.764	0.182	-2.051	-2.033	-0.701	0.105	2.105	1.801	-0.404
05501	0.122	0.453	-0.713	-0.545	0.142	-0.131	0.466	-2.387	-0.956	0.886	-1.083	0.199	0.435	0.271
05601	0.195	-1.136	-0.410	0.476	0.008	-0.259	0.358	-0.167	0.847	0.032	0.026	0.028	-0.911	0.044
05602	-0.858	-0.280	-1.065	-0.759	-1.015	-0.696	0.793	0.378	1.263	-0.012	-0.466	-0.717	0.573	-0.574
05603	-0.467	0.253	-0.641	-0.346	-0.372	-0.044	0.426	-1.155	-1.346	0.108	0.490	-0.596	0.206	-0.284
05701	-1.176	-0.374	-1.731	0.593	-0.196	-0.110	1.204	-0.306	-1.175	0.634	0.769	-0.043	-0.043	-1.557
05801	0.443	-0.748	-0.504	0.903	0.557	-0.093	0.758	-0.411	0.206	-0.717	0.154	0.312	-0.190	-0.999
05802	-1.403	-0.866	-0.554	-0.689	-0.474	0.001	0.904	0.151	1.030	-0.989	0.936	0.587	0.836	0.444
05803	-1.365	-0.094	-0.923	0.226	-0.084	0.152	1.249	0.279	-0.971	0.878	0.098	0.716	1.431	-0.636
05901	-0.003	-0.642	-1.263	0.421	-0.546	-0.130	0.270	-0.349	-0.734	-1.145	-0.185	-0.162	-0.349	-0.021
05902	-1.361	0.028	-1.381	0.268	0.295	-1.174	1.254	-0.908	-0.741	1.014	1.100	-0.879	-0.937	0.083
06001	0.806	-0.392	-0.171	0.075	-0.507	-0.016	0.305	-1.256	0.378	0.388	0.023	0.511	0.430	-0.290
06002	-0.798	0.006	-0.618	-1.115	-0.212	-0.191	-1.694	-0.675	-0.157	1.349	-0.738	0.426	1.030	1.198
06003	-1.280	0.414	-0.813	-0.154	-0.203	-0.779	1.139	0.174	0.691	2.274	-0.042	-0.561	-0.005	-0.728
06004	-1.021	-0.121	-0.767	-0.554	-0.251	-1.277	0.316	-0.712	0.164	0.979	0.182	-1.094	1.128	-0.017
06101	0.231	-0.134	0.006	-0.023	0.945	0.155	0.189	0.787	-0.440	2.127	-1.284	0.076	2.534	1.926
06201	-1.730	-0.950	-0.069	-1.378	1.067	0.305	-1.643	1.105	-0.397	-1.142	0.460	-0.506	2.337	0.732
06202	0.202	-1.558	-1.032	0.695	1.347	-0.593	-0.519	0.915	0.072	0.236	0.486	0.560	0.267	1.270
06203	-1.031	-1.308	-1.670	-0.466	0.337	-0.384	0.458	0.987	-0.643	1.271	-0.100	-1.672	0.714	1.319
06204	-1.453	-1.403	-1.875	0.129	0.002	-0.285	-0.729	1.051	-0.743	1.375	0.717	-0.183	1.475	1.150
06205	-1.289	-0.605	-1.813	0.327	1.290	-0.222	-0.043	1.027	-0.353	-0.104	1.206	0.720	1.541	1.555
06206	-0.455	0.525	-2.021	-0.180	0.097	0.099	0.556	-0.198	-0.339	1.727	-1.503	2.020	2.771	1.435
06207	-1.231	-0.367	-0.983	-0.424	0.595	-0.490	-1.191	1.096	-0.281	1.310	-0.772	-1.334	1.583	2.785
06301	-0.003	-0.605	-1.086	0.369	-0.093	0.345	0.891	0.137	0.036	-0.651	-0.200	1.292	-0.272	-0.263

TABLE B-4 CONTINUED

ROTATED FACTOR SCORE MATRIX

COUNTY GROUP CODE	FACTOR 1	2	3	4	5	6	7	8	9	10	11	12	13	14
06302	-0.549	-0.459	-2.426	0.576	0.232	0.122	2.351	0.398	0.163	0.372	0.160	1.224	0.535	-0.024
06303	-1.897	-0.020	-1.232	0.002	0.366	-0.111	1.970	2.075	-0.639	1.211	0.494	-0.287	1.635	-1.219
06304	0.274	-1.377	-1.050	0.920	0.625	0.138	0.361	-0.166	0.147	-0.194	-0.104	-0.059	-0.558	0.076
06305	-0.280	-0.300	-1.429	-0.405	-1.212	-0.511	1.195	1.665	-0.428	-0.795	-0.562	0.305	-1.038	0.826
06306	-1.526	-0.978	-2.424	0.279	-1.054	-0.170	0.115	0.033	-1.555	-0.153	0.985	1.331	-0.327	-1.233
06307	-1.453	0.493	-1.418	-0.537	-0.652	-1.050	0.226	0.316	1.382	-0.160	-1.841	-0.396	-0.889	-0.787
06308	-1.528	0.167	-1.411	-0.512	-0.700	-0.973	0.729	-0.178	0.364	0.949	-0.765	-0.040	-0.398	-0.642
06401	-0.990	0.570	-1.533	-0.001	0.497	-1.416	1.057	-0.175	-0.085	0.311	1.855	-0.924	-1.927	-0.220
06501	-0.442	-0.516	-1.400	0.415	-0.105	0.460	0.314	-0.869	0.385	-0.748	0.133	1.379	0.077	-0.760
06502	-0.859	-0.202	-1.196	-0.578	-0.377	-0.048	1.060	-1.143	-1.454	0.483	0.743	-2.036	0.617	-0.148
06601	-0.912	-1.795	-2.299	1.624	0.239	1.108	-0.635	0.109	-0.540	-0.881	0.873	0.359	-0.425	-1.402
06602	-0.624	-0.876	-1.886	-0.762	-2.005	-0.150	0.291	1.139	-1.578	-2.470	1.087	0.436	-1.621	0.078
06603	1.454	-0.617	-1.496	0.117	-0.335	0.488	1.313	0.796	-1.017	-2.603	0.038	0.026	0.356	0.054
06604	-1.506	-1.048	-3.087	0.637	-1.607	1.342	0.232	-0.611	-2.074	-1.843	0.973	0.180	0.951	-1.659
06605	0.712	0.045	-1.431	-0.214	-0.123	0.665	-0.218	-1.299	-2.003	-0.806	-0.373	1.153	0.449	-0.285
06701	-1.725	-0.850	-2.608	0.071	-0.850	0.981	-0.407	-0.660	-0.305	-2.677	0.785	-0.314	-0.552	-0.859
06702	0.130	0.670	-0.758	-0.742	-0.006	1.300	-0.269	-0.341	-1.903	0.528	0.224	1.000	0.013	0.645
06801	-0.573	-0.194	-1.185	-0.089	0.322	0.821	0.789	-0.612	0.845	-0.970	0.477	2.528	-1.274	-0.294
06802	-1.618	0.329	-0.929	-0.315	-0.270	1.329	0.247	0.180	-0.036	1.309	0.838	1.140	-2.073	-1.362
06901	0.422	-0.718	-0.869	-0.408	-1.196	0.746	-0.571	-2.158	-1.966	-1.930	1.154	2.582	1.210	-1.417
06902	-0.281	-0.281	-1.295	0.276	0.011	0.740	1.017	0.107	-0.792	0.377	-0.197	0.430	-0.321	-0.322
06903	0.229	-0.370	-0.332	-0.390	-0.267	0.744	0.219	-0.950	-1.758	-0.237	-0.072	1.608	-1.170	0.019
07001	-0.508	-0.742	-0.498	-0.331	-1.184	-0.930	0.991	-1.703	1.248	-0.853	0.437	1.212	-0.677	-0.049
07002	-1.231	0.268	-1.590	-0.968	0.414	-0.111	1.369	-1.304	-0.708	1.417	-1.874	-1.084	-0.462	-0.521
07101	-0.682	-1.101	-0.556	0.148	1.435	-0.190	0.345	0.014	-0.512	-0.994	1.062	1.553	-1.562	0.248
07102	-0.904	-0.028	-1.028	-0.658	-1.000	-0.515	1.653	-1.308	-0.316	0.499	-0.195	-0.660	-1.633	-0.473
07201	0.190	-2.114	-0.377	0.437	0.576	0.252	0.009	-0.302	0.848	-0.280	0.151	-0.941	-0.058	-1.504
07202	1.986	0.177	-0.832	-1.251	-0.765	-0.623	0.932	1.722	1.519	-2.422	-1.623	-0.277	-0.958	0.224
07203	-0.380	-0.749	-0.704	-0.713	-0.684	0.115	1.065	-1.697	-0.066	-0.474	0.077	-0.327	0.174	-1.222
07204	1.649	-0.401	-0.284	0.084	-0.076	0.106	1.641	-0.013	-0.848	-1.063	-0.209	-1.148	-0.215	0.411
07205	-0.459	-0.099	-1.796	0.034	-0.361	-0.612	0.436	0.838	0.093	-1.695	-0.689	-0.888	0.062	0.126
07206	-0.997	-0.587	-3.158	1.372	-0.233	0.184	-0.140	-0.182	-0.770	-0.754	0.095	0.107	-0.817	0.907
07207	-1.784	0.194	-1.100	-0.030	0.280	-0.484	-0.251	-0.303	0.493	-0.663	0.755	-0.157	-1.400	-0.421
07208	-0.348	-0.044	-0.811	-0.942	-0.118	-0.450	0.341	-1.725	-2.488	-0.440	0.869	-0.353	0.533	0.204
07301	-0.157	-0.213	-2.375	0.584	0.268	0.132	1.249	-1.640	0.130	-0.422	0.268	-0.913	0.938	-0.601
07302	0.511	0.363	-1.105	-0.313	1.528	-0.018	0.960	-1.572	-0.606	0.158	-0.600	1.759	1.983	-0.396
07401	-0.384	0.102	-1.349	-0.107	0.083	-0.553	0.794	0.049	0.492	-0.231	0.294	0.498	0.022	-0.576
07402	0.658	0.973	-0.711	-0.956	-0.253	-1.080	0.435	-2.966	-0.467	0.565	-0.375	0.072	0.495	-0.619
07403	-1.017	0.939	-1.340	-0.417	0.510	-1.900	1.111	0.215	-0.350	1.390	0.285	0.226	-0.834	-0.119
07501	-0.583	1.598	-0.836	-1.173	1.009	-1.367	0.124	-0.941	-0.527	-1.853	0.726	-0.585	2.115	-0.914
07601	-0.607	-0.462	-0.821	0.187	-1.039	0.330	2.839	-0.408	-1.718	-0.183	1.536	-0.119	-0.616	-2.538
07602	-1.002	0.368	-1.052	-1.084	0.020	-0.593	0.598	-1.055	-1.302	0.288	-0.821	-0.762	-1.212	-0.408
07701	-1.192	-0.461	-1.341	-0.351	-0.840	0.003	-0.256	-1.144	-1.158	-0.934	-0.048	-0.551	-0.711	-0.539
07702	1.707	-0.171	0.566	-1.363	-0.423	0.451	-0.198	-2.816	-1.023	-1.706	0.302	1.509	1.486	-1.675
07703	-0.049	-1.210	-1.031	0.298	0.620	0.050	0.249	-0.466	0.007	0.058	0.313	1.122	-0.733	-0.971
07704	1.016	0.329	-0.823	-1.176	-0.938	-1.259	2.320	2.062	-1.450	-1.137	0.497	0.363	-0.268	-0.240
07705	-0.772	0.710	-0.940	-0.579	0.884	-0.544	1.335	-1.188	-1.296	-0.296	0.721	-1.033	-0.742	-0.360
07801	-0.289	0.527	-0.493	-1.583	-0.093	-0.233	1.243	-0.089	-0.463	-0.228	0.009	2.049	-1.012	-0.486
07802	-0.607	-0.042	0.074	-1.986	0.478	-0.237	0.438	-0.505	0.335	-0.750	0.279	-0.163	-0.082	0.289
07803	-1.136	0.809	-0.239	-1.454	0.992	0.508	-1.053	0.820	0.194	1.484	0.656	0.406	0.386	-0.330
07901	-0.477	1.417	-0.172	-1.526	0.544	-0.073	0.664	-0.877	1.102	0.497	-1.476	-0.080	-0.615	-0.512

TABLE B-4 CONTINUED

ROTATED FACTOR SCORE MATRIX

COUNTY GROUP CODE	FACTOR 1	2	3	4	5	6	7	8	9	10	11	12	13	14
08001	-0.506	0.414	-1.635	-0.242	0.843	-0.061	-2.091	0.184	1.106	0.375	-1.044	1.301	1.146	-0.025
08002	-0.792	1.318	-0.266	-1.703	0.170	0.283	-1.210	0.133	0.516	0.170	-0.291	-0.230	0.662	-0.607
08101	0.290	1.385	0.385	-1.445	1.815	0.003	-0.698	-0.334	-1.737	-0.604	0.083	-0.333	0.588	-0.084
08201	1.360	-0.898	0.201	-1.170	-0.050	0.459	0.943	-2.563	0.978	-1.054	0.895	1.024	-0.481	-0.151
08202	0.263	-1.598	0.157	-1.803	-0.163	0.042	-1.395	-3.232	0.767	-1.247	-0.775	1.652	-0.690	0.138
08203	-0.571	-0.171	-1.177	-2.320	-2.542	-0.053	-0.455	-1.417	2.304	-2.411	-1.263	-0.638	-0.863	-0.449
08204	-0.423	1.994	-1.009	-1.208	0.654	0.274	-0.378	-1.096	0.366	-0.829	-0.570	-0.747	-0.447	-1.071
08205	0.180	1.213	-0.290	-1.332	0.812	-1.647	-0.123	-0.565	-0.721	-0.856	0.195	-0.694	-1.760	0.025
08206	-0.151	1.630	0.117	-1.707	0.702	-0.209	0.560	-0.564	0.465	-1.015	-0.038	0.997	0.297	-0.882
08207	0.088	2.557	0.137	-1.253	2.302	0.114	-1.327	1.214	-0.986	-1.462	0.353	-1.703	-1.255	-1.623
08301	0.736	2.303	0.073	-0.989	0.993	-0.220	-0.352	-0.815	0.586	-1.325	-0.076	-0.180	-0.512	-0.308
08401	0.119	2.262	0.682	-1.257	0.327	-0.976	-1.561	1.811	-0.031	-0.910	0.928	-0.229	0.381	-2.776
08501	0.617	1.494	0.469	-1.065	-0.144	-0.079	-0.793	0.498	0.664	0.528	0.867	-0.588	-0.458	-0.721
08601	0.125	2.305	0.618	-1.119	0.351	-1.457	-1.247	1.281	-0.218	0.160	0.952	0.005	-0.486	-2.881
08701	0.361	1.703	0.637	-1.652	1.691	-1.907	-0.157	-0.039	-0.302	-1.789	1.541	0.714	0.375	-0.370
08801	0.297	1.669	-0.266	-0.823	0.317	-0.439	-1.373	-0.675	0.862	0.033	0.606	-1.003	-0.010	-1.314
08901	-0.126	2.174	-0.024	-1.034	1.233	-2.690	0.570	-0.342	0.731	-0.079	0.890	-0.800	-0.303	-2.212
09001	-0.142	2.034	0.292	-0.952	2.170	-1.570	0.470	0.029	0.615	-0.373	1.288	-0.037	-0.354	-0.932
09101	-0.576	2.321	-1.144	-1.195	1.573	-2.083	0.541	0.087	1.422	-1.084	0.522	-1.231	-0.082	-1.262
09201	-0.248	2.176	-1.453	-0.435	1.429	-1.223	0.462	-0.275	0.802	-0.985	-0.265	0.852	-0.396	0.164
09301	0.958	-0.313	0.333	-1.033	0.067	-2.262	-0.496	-1.926	1.730	0.303	0.292	-0.238	-1.261	0.987
09302	0.272	1.570	-0.674	-0.552	1.245	-0.603	0.348	-0.964	-0.242	0.443	-0.335	0.535	0.898	-0.672
09401	0.373	0.049	-0.334	-0.403	-0.107	-0.051	1.075	-1.600	2.208	-0.362	0.991	0.598	-0.214	-0.330
09402	-0.596	2.335	-0.662	-0.970	1.733	-2.519	-0.088	0.556	0.370	-1.763	0.974	-0.536	-0.122	-0.818
09501	0.402	1.150	0.156	-0.880	1.318	-1.868	-0.495	-2.616	0.622	-0.782	-0.085	1.717	-0.662	0.387
09601	0.500	2.707	-0.611	-0.127	1.755	-1.196	0.692	0.856	1.175	-0.195	0.038	0.238	0.083	-1.827
09701	0.804	-0.028	-0.188	-0.065	0.401	0.575	1.102	0.303	0.178	1.357	0.895	0.008	-0.118	-0.318
09702	0.216	1.382	-0.209	-0.491	1.912	-0.761	1.232	0.296	0.417	0.934	0.742	-0.635	1.062	-1.384
09801	2.661	0.711	-0.421	-0.833	-0.258	-0.646	2.188	0.624	1.169	0.012	-1.595	-1.364	-0.072	0.193
09802	-1.335	-1.042	-0.514	-0.210	-0.797	0.125	-0.449	-0.335	2.842	0.885	-0.171	0.958	-0.053	-0.351
09803	0.083	-1.318	0.151	-0.037	0.009	0.059	0.065	-0.710	1.341	0.405	0.320	0.286	0.301	0.136
09804	0.618	-0.438	0.404	-0.544	0.351	-0.404	-0.840	-0.780	-0.090	-0.130	1.238	2.415	1.127	0.468
09805	0.705	1.505	-0.090	-0.690	1.800	-0.921	0.139	-1.292	0.470	0.039	-1.076	1.575	1.041	0.192
09806	-0.415	1.132	0.211	-0.689	1.961	-1.307	0.113	-0.566	0.540	-0.340	-0.328	-2.073	-0.560	0.205
09901	0.365	0.566	0.936	-0.645	1.438	-1.504	-0.360	-1.793	-0.262	-0.293	-0.071	0.740	0.289	1.168
10001	-1.070	0.507	-0.467	-0.526	0.761	-0.983	0.118	0.077	0.355	1.398	0.191	0.148	-0.689	-0.130
10101	-0.743	-0.503	-1.743	0.054	0.194	-0.598	-1.150	-0.283	0.180	0.037	-0.677	0.182	0.851	0.796
10102	-0.989	-1.125	-0.495	0.405	0.420	0.136	-1.581	0.903	1.621	0.345	0.467	1.788	0.714	0.217
10103	-1.006	-1.758	-0.142	2.063	2.122	-0.034	-1.610	-1.479	0.528	0.880	0.523	0.231	-0.037	-2.218
10104	1.510	-0.693	-0.769	-0.023	-0.010	-0.543	0.479	0.770	0.855	-1.152	-0.746	-0.407	0.241	0.153
10105	-2.163	-0.436	-1.409	-1.311	-2.004	-0.342	-0.187	-1.110	1.257	-0.726	0.695	-1.221	1.092	0.462
10106	-1.801	0.061	0.670	-0.828	0.966	-0.097	-1.513	0.101	-0.382	-1.201	0.815	0.310	0.735	-0.341
10107	-0.893	0.655	-0.182	-0.630	1.825	-0.310	0.089	-0.124	0.930	-0.477	-0.460	-0.234	1.298	-0.232
10108	-0.177	-0.191	0.483	-1.020	0.832	1.127	-0.610	-0.941	-0.602	0.316	-0.475	0.501	1.463	0.519
10201	-0.340	0.897	0.846	-0.169	0.530	1.512	0.233	-1.226	1.038	-0.966	-1.338	1.066	-1.247	1.445
10202	-0.773	0.143	0.393	-0.309	0.893	1.101	-0.463	-1.163	0.087	-1.963	-0.243	-1.639	1.121	1.978
10301	-0.926	0.600	1.076	-1.210	0.678	-0.443	-0.206	-0.896	1.815	-1.528	0.492	-0.215	-0.146	1.781
10302	-0.445	0.933	0.775	-0.708	1.636	0.195	0.359	0.598	0.478	1.147	0.083	-0.107	-0.768	0.029
10401	0.521	-0.425	0.259	0.852	-0.038	-1.857	-0.301	-0.602	0.805	1.750	-0.857	-0.190	1.121	0.604
10402	-0.770	0.914	1.484	0.011	-0.181	1.267	-0.140	-0.550	-1.054	0.858	0.546	-0.023	-1.481	1.334
10403	-1.149	1.188	0.349	1.131	0.475	1.107	0.849	-1.057	0.750	-0.174	-0.909	0.412	-0.811	0.116

TABLE B-4 CONTINUED

ROTATED FACTOR SCORE MATRIX

COUNTY GROUP CODE	FACTOR 1	2	3	4	5	6	7	8	9	10	11	12	13	14
10501	-1.095	0.116	2.193	-0.905	-0.319	0.805	-0.527	0.107	-0.290	0.236	1.616	-0.903	-1.065	0.698
10601	0.849	-0.209	0.482	0.044	-0.590	0.292	0.933	1.185	0.852	1.595	0.695	-0.234	0.096	-1.205
10602	0.308	0.930	1.803	-0.493	-0.369	1.047	-0.439	-0.028	-0.181	0.147	0.016	0.491	-0.053	-1.609
10603	0.183	0.676	0.646	-0.646	-0.478	-0.075	-1.544	0.474	-0.760	0.678	0.287	0.942	-0.230	-0.976
10701	0.803	-0.121	0.470	0.237	-0.467	-0.724	0.044	0.133	0.952	1.038	0.960	0.807	0.224	-0.667
10702	0.198	1.570	0.706	-0.248	2.057	0.440	-0.387	0.509	0.238	0.346	0.797	-0.007	0.673	-0.562
10703	0.031	0.688	1.233	-0.021	0.783	-0.331	-1.141	0.935	0.358	0.608	0.447	0.432	0.249	0.110
10801	-0.050	1.194	1.227	0.151	0.630	-1.489	-0.962	0.565	0.494	0.682	1.692	0.162	-0.332	-1.514
10901	0.189	1.553	0.154	-0.065	-0.093	-0.742	-0.370	0.662	1.074	0.160	0.485	0.052	0.264	-0.496
11001	0.697	1.179	0.775	0.402	-0.022	-0.830	0.603	-0.460	0.707	-0.216	0.714	1.427	1.073	0.407
11101	0.461	1.196	-0.048	0.539	-1.010	-1.501	0.778	2.118	0.919	1.167	0.811	0.470	1.367	-1.020
11201	0.499	1.457	0.612	1.089	2.180	-1.737	0.940	1.423	0.271	0.373	0.665	0.345	-0.228	-0.123
11301	1.074	-0.233	0.640	0.647	-1.095	-0.433	1.880	-0.432	1.445	0.646	0.472	-0.286	0.208	-0.547
11302	0.154	-0.678	-0.190	0.569	-1.021	-0.328	0.930	-0.079	-0.470	0.185	1.161	-0.055	-0.352	0.196
11303	-0.519	0.671	0.262	0.430	0.801	-0.566	0.452	-0.808	-0.150	0.101	0.404	0.848	-0.645	1.093
11401	0.282	0.455	0.835	1.029	1.435	-1.310	-0.435	-0.068	-0.325	-0.103	1.484	-0.202	-0.030	0.623
11501	2.037	-0.323	1.478	0.046	-0.375	-1.900	-1.509	-2.509	-0.855	-0.765	0.537	1.351	-0.711	0.705
11502	0.499	1.854	0.095	1.655	0.853	0.241	-1.280	-1.556	-0.968	-0.783	-1.114	1.344	0.248	0.334
11601	0.722	0.442	-0.540	2.391	-0.119	-0.769	0.298	-1.501	0.567	0.524	0.035	-1.808	1.002	0.151
11602	0.109	0.868	-0.215	1.611	0.865	-0.297	0.625	-0.134	0.641	0.294	-0.262	-0.236	0.353	1.051
11603	-0.649	1.559	-0.911	2.776	1.100	0.868	0.154	-0.037	0.920	0.827	-2.402	-0.544	0.468	0.319
11701	-1.089	0.849	0.272	1.189	0.872	-0.154	-0.874	0.722	0.522	0.818	-0.080	-1.632	-1.281	0.263
11801	-0.110	1.063	-0.031	2.203	0.286	0.478	-0.825	0.411	0.034	0.179	0.027	-0.534	0.815	0.067
11901	-0.175	1.465	0.002	2.720	1.051	1.354	-0.091	-0.455	-0.157	-0.916	-1.731	-0.162	-0.457	-0.687
12001	1.272	0.062	0.781	1.502	-0.426	-0.609	1.073	-1.515	0.844	0.030	0.898	-1.193	1.410	-0.051
12002	-0.213	1.284	0.473	2.129	0.955	1.487	-0.117	-0.163	-0.034	-1.492	-2.557	-2.001	0.590	-0.867
12101	-0.824	0.556	0.850	1.028	-0.081	1.122	-0.591	-0.996	0.625	-0.417	-1.391	-0.724	-0.253	1.080
12201	-0.295	0.229	0.008	1.417	-0.752	0.684	0.342	0.099	1.645	0.189	0.100	1.082	-0.067	0.686
12202	-0.696	0.593	-0.389	0.951	-1.042	0.464	-0.362	-1.816	0.534	-0.137	-0.506	-1.524	0.232	2.373
12301	1.221	-0.261	-0.022	1.418	-0.927	-2.252	-1.725	-0.344	-0.700	-0.182	-0.682	1.143	0.666	1.617
12302	0.662	-0.780	0.311	2.466	1.561	0.683	-0.485	-0.140	1.133	-0.592	0.687	0.259	1.822	-0.972
12303	0.118	-0.591	0.211	0.240	-1.972	-0.870	0.822	0.958	1.664	0.028	0.892	0.491	1.409	0.750
12304	-0.984	1.113	-0.370	2.240	-0.725	0.794	-0.167	1.189	0.213	-0.154	-1.653	0.515	1.711	0.737
12305	-0.667	1.077	-0.004	0.442	-3.281	0.224	0.687	0.687	1.213	1.039	-0.816	-0.197	0.764	-0.518
12306	-0.692	1.078	-0.001	1.682	-0.401	1.169	0.345	0.395	-0.091	-0.092	-1.476	0.671	0.551	0.340
12401	-0.373	1.409	0.058	1.728	-0.921	0.134	0.059	0.623	0.876	-1.120	0.220	-1.237	1.713	-0.150
12402	-0.198	0.940	-0.638	1.157	-0.712	-0.088	-0.960	1.027	0.608	0.116	-0.444	0.273	0.691	1.546
12501	-0.281	0.069	-1.179	1.977	-0.194	0.311	0.034	1.709	0.324	-0.421	-0.094	1.658	0.680	1.238
12502	0.990	-0.118	0.147	1.022	-1.395	-0.079	1.313	0.438	0.862	0.458	-0.084	-0.455	1.172	0.042
12503	0.070	0.933	0.050	1.629	1.016	0.120	0.010	1.998	-0.465	0.062	0.541	0.714	-0.179	1.146
12601	0.175	-0.464	1.391	-0.026	-0.858	-0.325	-0.704	0.253	0.714	0.447	1.647	1.372	0.294	0.358
12602	-0.244	1.219	1.375	0.390	0.168	-1.081	0.313	0.902	-0.360	-1.281	1.250	-0.050	0.816	0.689
12701	-0.039	1.178	1.971	-0.071	-0.321	1.791	0.022	-0.466	1.041	-1.985	-0.216	1.315	1.426	-0.731
12702	0.095	0.398	0.631	0.682	-1.208	-2.001	-0.973	1.345	0.031	0.795	1.386	1.265	0.367	1.644
12703	0.145	1.440	1.502	-0.231	-0.730	1.019	-0.486	-0.041	0.539	-1.582	0.012	0.457	1.967	0.703
12801	0.530	-0.348	1.709	-0.275	-1.667	-0.888	-1.116	0.735	0.636	0.481	0.481	0.684	1.312	-0.058
12802	0.376	1.157	0.409	0.205	-0.522	-1.307	-0.792	1.639	-0.270	1.046	1.464	0.543	1.084	-0.671
12901	1.730	-0.049	0.868	-0.936	-1.728	-1.513	-1.789	-0.193	-0.490	0.657	2.164	0.144	-0.813	0.042
12902	1.035	0.885	0.563	-0.636	-1.879	0.087	-3.046	0.858	-1.601	0.315	-0.020	-1.583	2.205	-1.515
13001	0.844	0.753	0.124	-0.414	-0.238	-1.389	-0.833	0.232	-0.258	2.034	0.880	0.494	0.356	0.180
13101	0.918	0.297	0.141	-1.095	-2.200	0.571	1.203	0.631	1.828	0.705	0.519	0.762	-0.087	-1.225

TABLE B-4 CONTINUED

ROTATED FACTOR SCORE MATRIX

COUNTY GROUP CODE	FACTOR 1	2	3	4	5	6	7	8	9	10	11	12	13	14
13102	1.907	0.648	-0.161	-1.493	-1.969	0.661	0.576	-0.594	1.384	-1.215	-0.801	0.707	0.979	-0.097
13103	0.919	-1.147	0.679	-0.068	0.548	0.449	0.347	-0.978	1.685	1.177	0.147	2.146	0.496	-0.677
13104	0.334	1.941	0.380	-1.382	-0.371	0.131	-0.847	-0.159	0.018	0.269	-0.119	2.279	-0.017	-0.412
13201	0.445	0.750	-0.744	-0.620	-0.197	0.493	-1.363	-1.160	-0.528	0.345	-0.033	3.631	-0.323	1.840
13202	0.636	-0.124	-0.128	-1.205	-0.967	0.569	-0.049	-1.029	1.246	0.454	0.840	1.863	0.127	0.035
13203	0.304	1.513	-0.067	-0.849	-0.190	0.583	-0.322	0.893	-0.375	1.315	0.993	-0.467	0.427	0.279
13301	0.201	1.727	0.498	-1.601	-0.395	0.379	0.334	-0.004	1.470	-0.679	0.785	-1.341	-0.967	-0.451
13401	1.001	0.569	-0.859	-0.368	0.126	0.694	-0.953	-1.150	1.746	1.290	-0.207	0.459	-0.310	0.654
13402	0.115	1.795	-0.823	-0.532	0.061	1.982	-0.133	0.237	0.096	1.638	-0.408	0.055	0.479	-0.450
13501	1.589	-0.338	-1.334	-0.024	-0.029	1.390	-0.078	-0.349	0.472	0.589	-0.604	-0.854	-0.915	0.260
13502	-0.323	-0.234	-2.227	-1.321	-1.422	1.523	0.410	-0.366	1.657	-0.179	-0.118	-0.912	-0.569	1.722
13503	0.162	0.242	-1.812	-0.132	-0.105	1.477	-1.315	-0.091	1.488	0.881	-0.099	0.848	-0.752	0.537
13504	0.364	0.916	-1.619	-0.233	0.578	0.587	-1.249	0.079	-0.393	1.309	-0.534	-0.704	-2.212	2.034
13501	0.494	1.501	-0.157	-0.637	0.570	1.752	-0.793	0.732	0.996	1.309	-1.291	0.191	-1.281	0.622
13701	0.884	-0.237	-0.618	0.221	1.126	1.286	-0.054	-0.346	1.898	1.005	-0.184	0.501	-1.084	0.285
13702	0.858	0.273	-0.860	-0.992	-0.652	1.296	0.610	-0.048	1.319	0.618	-1.155	-0.470	-0.651	0.375
13703	1.014	0.996	-0.858	-0.598	0.601	2.061	-0.255	-0.752	-0.842	1.346	-1.458	-1.400	0.326	0.500
13704	-0.480	1.170	-1.697	-0.543	0.284	2.587	-0.323	-0.075	1.077	0.205	-1.580	-0.890	-0.948	0.616
13801	0.065	0.624	-1.186	-0.437	-0.182	2.887	1.028	0.422	0.045	0.454	1.143	-0.459	1.012	0.775
13901	0.593	1.662	0.705	-0.799	0.005	-0.003	0.291	0.257	1.558	0.741	0.279	-0.490	-1.326	-0.910
14001	0.497	-0.505	-0.579	-0.044	-1.788	0.478	-0.845	-1.597	-0.738	0.396	3.487	-3.835	-0.843	0.603
14002	0.401	0.699	-0.372	-0.855	-1.019	0.410	-1.064	-0.575	-0.486	2.181	2.593	-2.308	-0.966	0.365
14101	1.002	-0.088	0.780	-0.558	-0.926	1.700	1.335	-0.564	0.365	0.635	1.346	-0.010	-0.385	0.507
14102	0.957	0.166	0.131	-0.010	-0.575	0.794	-0.155	-0.452	-0.220	0.396	2.344	2.071	0.940	0.751
14103	-0.186	1.511	-0.079	0.369	-1.158	1.288	-0.633	1.526	-0.017	1.661	2.128	-0.255	0.394	-1.337
14201	1.515	-0.132	-0.202	0.213	-0.385	1.546	-0.286	-0.223	-1.265	0.217	1.602	0.291	-0.637	0.823
14301	1.277	-0.768	0.070	0.237	-0.522	1.848	0.581	0.228	-0.024	1.324	0.489	-0.706	-0.525	-1.235
14302	1.677	-0.097	-0.808	-0.550	-2.063	1.112	0.905	0.991	-0.324	0.201	0.727	0.036	-0.188	0.374
14303	0.270	1.239	0.071	0.052	-1.490	0.734	-1.042	1.674	0.268	0.218	0.582	0.577	0.408	-1.644
14304	0.870	0.735	0.657	-0.307	-1.116	0.762	-0.781	0.932	0.159	-0.005	0.125	0.910	-0.159	-1.127
14305	0.667	1.113	-0.577	-0.168	-2.368	1.189	0.108	1.914	0.512	0.451	0.190	1.057	0.151	-2.314
14306	0.693	0.542	0.224	-0.200	-1.150	2.024	0.463	0.614	-0.321	1.282	1.436	0.770	0.360	-0.440
14307	-0.037	0.164	-0.676	0.092	-0.954	1.406	-0.066	1.028	-0.099	0.485	2.197	0.198	-0.111	-0.127
14308	2.279	0.335	0.134	-0.219	-0.752	0.807	-0.741	-1.577	-1.676	-0.468	0.945	-0.602	1.306	-0.418
14309	0.282	1.361	0.721	-0.341	0.078	1.486	-1.111	1.148	0.032	0.275	0.694	0.620	-0.405	-1.579
14401	-0.146	0.387	-0.645	-0.112	0.067	2.043	-2.528	1.249	1.031	-0.052	-0.487	-0.692	-0.585	-0.379
14402	0.056	1.110	0.003	-0.418	-0.325	1.555	-0.519	0.059	0.111	1.192	0.405	-0.355	-0.442	-0.790
14501	1.125	0.393	-0.478	-0.204	-1.183	0.805	-2.003	0.599	0.806	1.204	-0.151	0.365	-0.688	-0.595
14502	0.592	1.134	-0.147	-0.266	-0.043	1.954	-0.840	-0.037	-0.409	1.328	1.917	0.551	-0.716	0.515
14501	-0.112	1.556	-1.941	-0.118	-0.402	2.107	-0.483	0.911	0.852	1.231	-0.094	-0.473	-1.166	-0.082
14701	0.382	1.065	0.590	-0.137	-0.270	2.150	-1.386	0.488	-0.425	0.300	2.165	-0.426	-1.419	-0.233
14702	1.086	-0.498	-1.086	0.578	-0.453	1.776	-1.675	-0.108	0.264	0.749	-0.787	0.213	-0.503	-0.420
14703	2.531	0.196	-1.288	0.112	-0.873	0.819	0.055	1.576	0.929	0.180	-1.876	-0.325	-0.270	0.387
14704	1.726	-1.903	0.540	0.556	1.093	1.512	-1.609	-1.538	0.665	1.481	0.158	-2.252	0.861	-2.720
14705	2.026	-0.365	-0.977	0.086	-0.117	0.575	-0.460	0.923	1.723	1.035	-1.547	-0.596	-2.071	-0.069
14706	1.867	0.137	-1.106	-0.194	-2.104	1.526	0.097	-0.682	-0.519	-0.327	-1.437	-0.334	0.266	-1.788
14707	0.410	0.289	-1.107	0.194	-0.309	0.828	-2.288	0.320	-2.118	-0.014	1.597	-0.948	-1.946	1.173
14708	0.620	0.946	-0.402	-0.796	-0.660	1.610	-0.600	-0.013	0.756	0.258	0.968	-0.605	-0.650	1.091
14801	1.677	1.318	-0.619	-1.276	-3.102	2.471	-2.485	0.088	0.882	-0.293	-2.250	-0.978	-0.370	1.303
14901	1.327	-0.492	0.214	0.245	-1.150	-1.869	-3.043	-0.168	-0.602	1.090	1.697	-1.302	-0.908	0.624
14902	-0.125	0.388	0.169	-0.115	-1.576	-0.330	-3.388	1.434	0.774	1.014	-0.458	-0.433	-0.783	-0.872

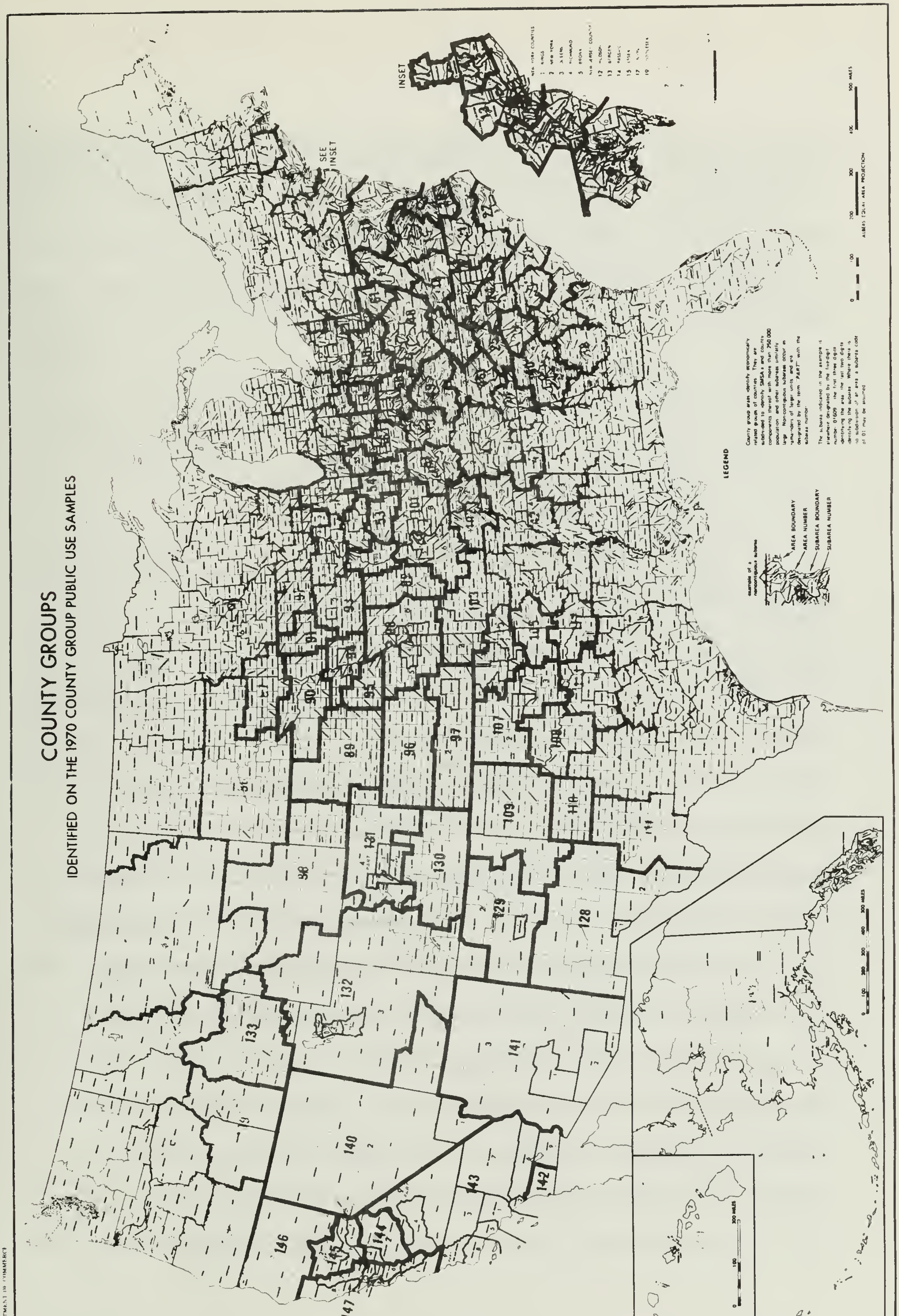

Figure B-1. County Groups

and earnings and who are employed primarily in white collar occupations. The factor has high positive loadings on the extreme upper ranges of the educational and earnings distributions. Conversely, the lower ranges of the educational and earnings distributions exhibit relatively high negative loadings. Surprisingly, positive loadings are observed on percent other male and percent other female. The factor is essentially null with regard to weeks worked, hours worked, age and unemployment.

Given the high positive loadings on the upper ranges of the educational and earnings distributions, it is not surprising to find high positive loadings on the percent of workers employed as professional, technical and kindred workers, managers and administrators, sales workers, and clerical and kindred workers. Negative loadings can be observed for the percent of workers employed as laborers except farm, transport equipment operatives, operatives except transport, farmers and farm managers and craftsmen.

The distribution of employment among industries also plays an important role in determining the character of the factor. The factor has high positive loadings on the percent of workers employed in professional and related services, business and repair services, and finance, insurance and real estate. Lower positive loadings can be found on the percent of workers employed in public administration, entertainment and recreation services, wholesale trade and retail trade. The only industrial categories displaying negative loadings below -.25 are manufacturing-durable goods and manufacturing-nondurable goods.

The county groups that score high on this factor tend to be situated just outside of large metropolitan areas. They include 01605 (Montgomery, Maryland), 01608 (Loudoun, Fairfax and Prince Williams, Virginia), and 00404 (Norfolk, Massachusetts). County groups that score very low on this factor include, 01415 (Schuylkill, Carbon and Monroe, Pennsylvania) and 10105 (Franklin, St. Charles and Jefferson, Missouri).

Factor 2: Agriculture / Rural areas

County groups scoring high on this factor are characterized by having a high percent of their employment in industries and occupations which are primarily agricultural. The industry categories agriculture, forestry and fisheries and the occupational categories farmer and farm manager, and farm laborer and foreman all display high positive loadings on this factor. The industry categories mining, construction, retail trade, and personal services and the occupational category private household worker all display low positive loadings on this factor. Conversely, the percent of workers employed in manufacturing, finance, insurance and real estate, and business and repair services all exhibit negative loadings. The only occupational category with a loading less than -.25 is clerical and kindred workers.

Low earnings are, perhaps, the second more important characteristic of this factor. The factor has high positive loadings on the lower range of the earnings distribution. Positive loadings are also evident for the lower range of the hours worked distribution, the upper range of the hours worked distribution and percent white male. Alternatively, the factor has negative loadings on the upper range of the earnings distribution, the upper range of the weeks worked distribution, the mid-range of the hours worked distribution, percent black male and percent black female. It is important to note that the factor is essentially null with regard to the age and education variables.

The county groups that score high on this factor tend to be found in rural agricultural areas. They include 08207 (Minnesota), 09101 (Iowa), and 09601 (Kansas). County groups scoring low on this factor tend to be found in urban-industrial centers. They include 01301 (Kings, New York), 01302 (New York, New York) and 01312 (Hudson, New Jersey).

Factor 3: Low Earnings / South

This factor derives its name from the high positive loadings on the lower range of the earnings distribution and the high negative loadings on the upper range of the earnings distribution. Percent earning 6000-6999 dollars appears to be the twist variable. Low positive loadings are also observed for the extreme lower range of the education distribution. Aside from the low negative loadings on percent with 12 years of education and percent white male and the occupational and industrial distributions, the factor is essentially null with respect to the remaining variables.

The factor has relatively low loadings for the percent of workers employed in construction, manufacturing-nondurable goods, personal services, and private household workers. The percent of workers employed in manufacturing-durable goods is the only industrial or occupational category having a high negative loading.

County groups scoring high on this factor tend to be found in rural areas of the South. They include 02104 (North Carolina), 04005 (Georgia), and 04602 (Tennessee and Kentucky). On the other hand, county groups having low negative scores are found in the North. They include 00902 (Trunbull and Mahoning, Ohio), 06604 (Genessee and Lapier, Michigan) and 06302 (Stark, Ohio).

Factor 4: Black Workers / Private Household Workers

The most notable aspect of this factor is its dependency on the sex-color variables. The factor has high positive loadings on percent black male and percent black female. Conversely, high negative loadings are exhibited by percent white male and percent white female.

Education also plays an important role in determining the character of this factor. The factor has high positive loadings on the lower range of the educational distribution and on percent with 9-11 years of education. However, negative loadings can be observed for percent with eight years of education and percent with 12 years of education.

This factor has negative loadings on the percent of workers who are 16-17 years old, 18-19 years old, and those who worked 15-29 hours. The only remaining variables having positive loadings greater than .25 are the percent of workers who worked 40 hours and who earned 3000-3999 dollars. In general, however, excluding the industrial and occupational distributions, the factor is virtually null with regard to variables other than sex-color or education.

The factor has high positive loadings on the industrial category personal services and the occupational category private household workers. The only occupational or industrial category displaying a negative loading is laborer except farm.

County groups having high scores on this factor tend to be situated primarily in urban centers or in the South. These county groups include 01601 (Baltimore City, Maryland), 01604 (District of Columbia), and 10103 (St. Louis City, Missouri). County groups scoring low on this factor include 01415 (Schuylkill, Carbon and Monroe, Pennsylvania) and 08203 (Anoka, Washington and Dakota, Minnesota).

Factor 5: Older Worker

The character of this factor is totally dominated by the age distribution. The factor has high negative loadings on the lower-middle range of the age distribution. Conversely, it has high positive loadings on the upper range of the age distribution. The percent of workers 45-49 years of age appears to be the twist variable.

Low positive factor loadings can be observed for the percent of workers with eight years of education, the percent of workers who earned 1000-1999 dollars, and the extreme lower range of the hours distribution. The percent of workers who worked 40 hours has a low negative loading. However, this factor is essentially null with regard to variables other than age.

The occupational and industrial distributions are of only secondary importance, having low absolute loadings. Low positive loadings are displayed by the occupational category, service workers, except private household. The industrial category, construction, and the occupational category, craftsmen, both have low negative loadings.

County groups scoring high on this factor tend to be in rural areas or the traditional retirement center, St. Petersburg. These county groups include 03304 (Pinellas, Florida), 10702 (Oklahoma), and 08207 (Minnesota). County groups scoring low on this factor include 04003 (Cobb, Gwinnet, and Clayton, Georgia), 12305 (Louisiana), and 14801 (Alaska).

Factor 6: Weeks Worked / Unemployment

This factor is totally dominated by the weeks worked distribution and the unemployment variable. The lower and middle range of the weeks worked distribution has positive loadings. Conversely, 50-52 weeks worked has a very high negative loading. The unemployment variable also plays an important role in this factor with a high positive loading. The only remaining variables with a loading greater in absolute value than .25 are the occupational category laborers and percent other male and female. The factor is effectively null with regard to the age, education, hours and the industrial and occupational distributions.

County groups scoring high on this factor are located, primarily, in the rural areas of Oregon and California. They include 13703 (Oregon), 14601 (California), and 14801 (Alaska). County groups scoring low on this factor include 01602 (Baltimore, Maryland), 01605 (Montgomery, Maryland) and 08901 (Nebraska).

Factor 7: Hours Worked

This factor is especially hard to interpret. The factor has high positive loadings on the upper middle range of the hours worked distribution. It also has a negative loading on the percent who worked 40 hours. However, all other hours variables are well below an absolute value of .25.

The only positive loadings observed for the occupational and industrial distribution are on manufacturing-durable goods and operatives, except transport. On the other hand, professional and related services,public administration, and service workers, except private household, all have negative loadings. Negative loadings are also observed for percent other male and percent other female. The only other loadings of interest are the positive ones on percent 16-17 years old and the percent who earned 35,000 dollars or more. This factor is essentially null with regard to the remaining variables.

County groups having high positive scores on this factor include 07601 (Winnebago and Boone, Illinois), 02601 (Pickens and Greenville, North Carolina), and 06302 (Stark, Ohio). County groups having high negative scores on this factor include 14901 (Honolulu City, Hawaii), 01604 (District of Columbia) and 14801 (Alaska).

Factor 8: Middle-aged Workers

As its name indicates, this factor is totally dominated by the age distribution. The factor has negative loadings on the lower middle range of the age distribution. Conversely, it has high positive loadings on the upper middle range of the age distribution. The percent of workers 30-34 years of age appears to be the twist variable.

Very few variables other than those in the age distribution have loadings greater than an absolute value of .25. The only remaining variables of interest are the percent of workers employed as craftsmen, which has a positive loading, and the lower middle range of the weeks worked distribution, which has negative loadings. This factor is essentially null with regard to unemployment, the earnings distribution, the industrial distribution, the hours worked distribution, the educational distribution and the sex-color distribution.

County groups scoring high on this factor include 01306 (Nassau, New York), 01313 (Bergen, New Jersey) and 11101 (Texas). County groups scoring low on this factor include 07702 (Dane, Wisconsin), 06901 (Clinton, Eaton and Ingham, Michigan) and)1607 (Arlington, Virginia).

Factor 9: Transportation, Communications and Other Public Utilities

The ninth factor is totally dominated by the occupational and industrial distribution. The factor has high positive loadings on the percent of workers employed in wholesale trade and transportation, communications and other public utilities. The factor also has positive loadings on the percent of workers employed in business and repair services, finance, insurance and real estate, and retail trade. Positive loadings are also observed for the occupational categories managers and administrators, sales workers, clerical workers, and transport equipment operatives. The only variable displaying a negative loading is the percent of workers employed in manufacturing-durable goods. The factor is essentially null with respect to all variables outside of the occupational and industrial distribution.

County groups that score high on this factor tend to be ones located in urban centers. They include 01301 (Kings, New York), 03101 (Duval, Florida) and 09802 (Platte and Clay, Missouri, and Wayndotte, Kansas). County groups scoring low on this factor include 05401 (Illinois), 06604 (Genesee and Lapier, Michigan) and 14707 (Lake, Napa and Solano, California).

Factor 10: Mid-remunerative

The earnings distribution is of principal importance for this factor. The factor has positive loadings on the mid-range of the earnings distribution. Of greatest interest is the high positive loading on the percent of workers who earned 6000-6999 dollars. The remaining variables of interest are the percent of workers who worked 15-29 hours, 30-34 hours, 48-49 weeks and 40 hours. The latter variable has a low postiive loading, while the remaining variables have low negative loadings. The factor is essentially null with regard to the age distribution, the occupational distribution, the industrial distribution, unemployment and the sex-color groups.

County groups having high positive scores on this factor tend to be located primarily in rural areas. They include 14002 (Nevada), 13001 (Colorado) and 06101 (West Virginia). County groups having high negative scores on this factor include 06602 (Macomb, Michigan), 07202 (DuPage, Illinois) and 08203 (Anoka, Washington and Dakota, Minnesota).

Factor 11: Sales and Service

The eleventh factor is totally dominated by the occupational and industrial distribution. The factor has positive loadings on the industrial categories retail trade and entertainment and recreation services and the occupational categories sales workers and service workes except private household. Negative loadings can be observed for the industrial category operatives except transport. The factor is essentially null with regard to all remaining variables.

County groups scoring high on this factor tend to have nationally recognized recreation and entertainment centers located in them, such as Las Vegas and Fort Lauderdale. They include 03301 (Broward, Florida), 03308 (Florida) and 14001 (Clark, Nevada). County groups scoring low on this factor include 01316 (Morris, New Jersey), 04103 (Mississippi) and 01409 (Chester, Pennsylvania).

Factor 12: Youth

Given the nature of this study, it is rather gratifying to observe a factor that could be described as "youth". As to be expected, it has positive loadings on the extreme lower range of the age distribution, the hours worked distribution, the weeks worked distribution and the earnings distribution. A positive loading is also observed for the percent of workers employed in professional and related services. The only variable having a negative loading less than -.25 is the percent of workers 30-34 years of age. It is important to note that this factor is essentially null with regard to the educational distribution, unemployment and the sex-color groups.

County groups that score high on this factor include 13201 (Utah and Weber, Utah), 13103 (Denver, Colorado) and 14102 (Pima, Arizona). County groups that score low on this factor include 14001 (Clark, Nevada), 01302 (New York, New York) and 01604 (District of Columbia).

Factor 13: Mining

The single most important variable for this factor is the percent of workers employed in mining. It exhibits a high positive loading. Other variables having positive loadings include the occupational category transport equipment operatives, the industrial category professional and related services and the percent of workers who are white males. Negative loadings can be observed for the percent of workers 16-17 years of age, the percent of workers with 9-11 years of education and the percent of workers who worked 15-29 hours.

Given the nature of this factor, it is not surprising to find that the county groups that score high on this factor are located in areas where mining is a highly important industry. Such county groups include 04902 (Kentucky), 04803 (West Virginia and Ohio) and 04804 (Kentucky, West Virginia and Ohio). County groups scoring low on this factor include 02104 (North Carolina), 02702 (South Carolina) and 14705 (San Mateo, California).

Factor 14: Construction

The fourteenth and last factor has positive loadings on the percent of workers employed in the industrial category construction and the occupational categories craftsmen and kindred workers and laborers except farm. Positive factor loadings can also be observed for the percent of workers 45-49 years old and 50-54 years old and the percent of workers who worked 40 hours. The only variables displaying negative loadings less than -.25 are the percent of workers who are nonwhite males and nonwhite females.

County groups having high positive scores on this factor include 02201 (North Carolina), 03307 (Florida) and 04802 (Putnam and Kanawha, West Virginia). County groups having high negative scores on this factor include 01302 (New York, New York), 01305 (Bronx, New York) and 08601 (South Dakota and Wyoming).

B.3 The Distance Matrix

By the use of factor analysis, a more parsimonious representation of the data matrix has been achieved. In fact, the size of the data matrix has been reduced from 33864 elements in the original data matrix to 5712 elements in the factor score matrix while retaining 73.5 percent of the variance of the original data matrix. However, any attempt to aggregate county groups on the basis of similarity with regard to the fourteen factors by a visual inspection of the factor score matrix is a formidable task. What is needed is a systematic method of comparing county groups with regard to their factor scores.

The method chosen for comparing county groups is a distance matrix. Since this study is concerned with the similarity of county groups as a basis for aggregation, the distance between county groups in factor space is of primary importance. That is to say, we need to ask the question: "What is the distance between county group i and county group j in factor space for all possible values of i and j?" 73.5 percent of the variance of the original variables that were factor analyzed is embodied in the resulting factors and reflected in the distances between county groups in factor space. Hence, comparing county groups on the basis of distance is in effect comparing the county groups on the basis of the original variables <u>except that the artificial weighting of correlated variables is removed.</u>[6]

The generalized form of the distance function can be written as,

$$d_{ij} = [\sum_{k=1}^{p} |S_{jk} - S_{ik}|^{\theta}]e_k^{\ 1/\theta} \qquad \text{(B-1)}$$

where,

- d_{ij} is the distance between county group i and county group j in p dimensional space
- S_{jk} is the factor score of county group j on factor k
- S_{ik} is the factor score of county group i on factor k
- e_k is the square root of the eigenvalue for the kth factor
- θ is some number greater than one

For the purposes of this study, it is assumed that $\theta = 2$. This implies the well known Euclidean formulation of the distance function. One characteristic of Euclidean distance is extremely important. Euclidean distance is

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[6]Richard Stone has used a method similar to this to compare the twelve civil defense regions of the United Kingdom for the year 1948. See Richard Stone, "A Comparison of the Economic Structure of Regions Based on the Concept of Distance," <u>Journal of Regional Science</u> 2 (Fall, 1960): 1-20.

invariant under rotation. Using other values of θ, such as $\theta = 1$, which implies the city block metric, implies that a fixed, unique set of axes exists for the space. In terms of factor analysis, the axes, which are the factors, are not unique and fixed, but can be rotated to achieve a number of solutions. For this reason, invariance under rotation is an important consideration in selecting the value of θ.[7]

For most purposes, the Euclidean distance function is left unweighted. That is to say, in multidimensional space the distance vector between any two objects on one set of axes is equally important as the distance vector between them on another set of axes in determining the distance between objects. This proves to be an undesirable property when working with factors as axes since all factors cannot "explain" the same percent of variance in the original data matrix. Factors that could explain the greatest percent of the variance should be given the greatest consideration when computing distances. For this reason, the square of the distance vector is weighted by the square root of the eigenvalue when computing distances.

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[7]For a discussion of the characteristics of various distance measures, see, P. Green and Frank Carmone, Multidimensional Scaling (Boston: Allyn and Bacon, Inc., 1970); or Warren Torgerson, Theory and Methods of Scaling (New York: John Wiley and Sons, Inc., 1958).

When computing distances the county groups are treated as being points in multidimensional space. Each factor score provides the projection of a given county group point on a given factor axis. Thus, factor score S_{ik} is the projection of ith county group on the kth factor axis. Some county groups may lie near each other in space. They will have small distance magnitudes from each other and like distance magnitudes from other county groups. It is extremely difficult to define such "clusters" by a visual examination of the distance matrix. There are effectively 83028 elements in the data matrix that would have to be examined.[8] What is needed, then, is a systematic empirical method to identify those county groups which tend to lie near each other.

B.4 Cluster Analysis

The determination of county groups that lie near each other in factor space is basically a cluster analysis problem. A hierarchical clustering algorithm has been

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[8]Since the distance between a county group and itself is equal to zero and distance is symmetric, i.e., independent of the direction of measurement, the m^2 = 166464, where m is the number of county groups (408), element distance matrix can be represented equally well by the upper or lower off diagonal elements. This leaves $m(m - 1)/2$ = 83028 elements to be examined. Because of the sheer bulk of the distance matrix, it will not be given here.

developed by Johnson which is well suited for the type of problem faced by this study.[9] Johnson has devised two basic forms of the hierarchical cluster scheme. These forms have been designated as the minimum and the maximum method. Only the maximum method,which was the method used in the empirical investigation of the distance matrix, will be presented here.

The maximum method of cluster analysis is fairly easy to understand. At the first cluster level, two objects are combined to form the first cluster. The value of the cluster is the distance between the two objects. Since this is the first cluster, its value must be the minimum distance in the distance matrix. That is to say, the distance between the two objects is the smallest distance in the distance matrix. The first cluster, then, contains the objects which are most similar. The distances between the first cluster and the remaining objects are defined as the maximum possible distance. For example, if i and j cluster at the first level to form C_1, the distance between C_1 and h is defined as the larger of d_{ih} or d_{jh}.

At the second cluster level, there are two possibilities. An object can join the already existing cluster

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[9]Stephen Johnston, "Hierarchical Clustering Schemes", Psychometrika 32 (September 1967): 241-254.

or two other objects can form a new distinct cluster. The value of the new cluster is the distance between the two objects or the object and the cluster. Since this is the second cluster, its value must be the smallest distance in the distance matrix. The distance between the second cluster and the remaining objects are defined as the maximum possible distance. For example, if h clusters with C_1, the distance between C_1 and g is defined as the larger of d_{ig}, d_{jg}, or d_{hg}.

For the third and remaining cluster levels, there are three possibilities. An object can join an already existing cluster, two objects can form a new distinct cluster, or two clusters may join to form a new cluster. The value of the new cluster is the distance between the two objects, the cluster and the object or the two clusters. The distance between the cluster and the remaining objects and clusters are defined as the maximum possible distance, as before.

Five points should be emphasized: 1. The value of a cluster is equal to the maximum intra-cluster distance. 2. The distance between a cluster and an object is equal to the maximum inter-cluster distance. 3. The distance between two clusters is equal to the maximum inter-cluster distance. 4. There are m - 1 possible cluster levels, with the value of the first cluster being equal to the smallest distance in the distance matrix, and the value of the last cluster being equal to the largest distance in the distance matrix. 5. At the last level, all objects cluster.

Gruvaeus and Wainer have proposed an addition to Johnson's hierarchical cluster analysis which produces a unique ordering procedure within clusters.[10] This addition was used in the empirical investigation.

As pointed out above, in all cluster levels above the second level, three actions may occur. 1. Two objects may form a cluster. 2. An object may join an already existing cluster. 3. Two existing clusters can combine to form a new cluster. In the first instance, Gruvaeus and Wainer arbitrarily order the pairs. In the second instance, the object is placed adjacent to the object on the outside of the already existing cluster with which it is closest. In the third instance, the endpoint objects of greatest proximity are placed adjacent to each other.

Using the Gruvaeus and Wainer ordering method results in unique cluster order. Hence, this addition to hierarchical cluster analysis is of the greatest importance when cluster order is critical.

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[10] Gunnar Gruvaeus and Howard Wainer, "Two Additions to Hierarchical Cluster Analysis," British Journal of Mathematical and Statistical Psychology 25 (September 1972): 200-206.

The cluster configuration of the factor score space is given in Table B-5. There are 407 possible cluster levels. However, only thirty-seven are reported here. Only every eleventh cluster value and the last cluster value are given. The cluster configuration itself will go largely undiscussed. It is enough to note here that county groups that are rural, urban, agricultural, industrial, and so forth, tend to form distinct and separate clusters. The interested reader can verify from Table B-5 that the cluster configuration is highly interpretable at all cluster levels.

The aggregated county groups are presented in Table B-6. The table can be interpreted in a straightforward manner. For example, aggregated county group 02 contains groups 01305 and 01312. The aggregated county groups were formed through a visual inspection of the cluster configuration under the condition that no aggregated county group should have a sample population of less than 20,000 individuals. This condition was imposed to insure that the general goal of reducing the standard errors of the regional proportions was satisfied. However, because of this added condition, the aggregated county groups do not correspond exactly to the cluster configuration.

TABLE B-5
County Group Cluster

VALUE OF CLUSTER

TABLE B-5 (continued)
County Group Cluster

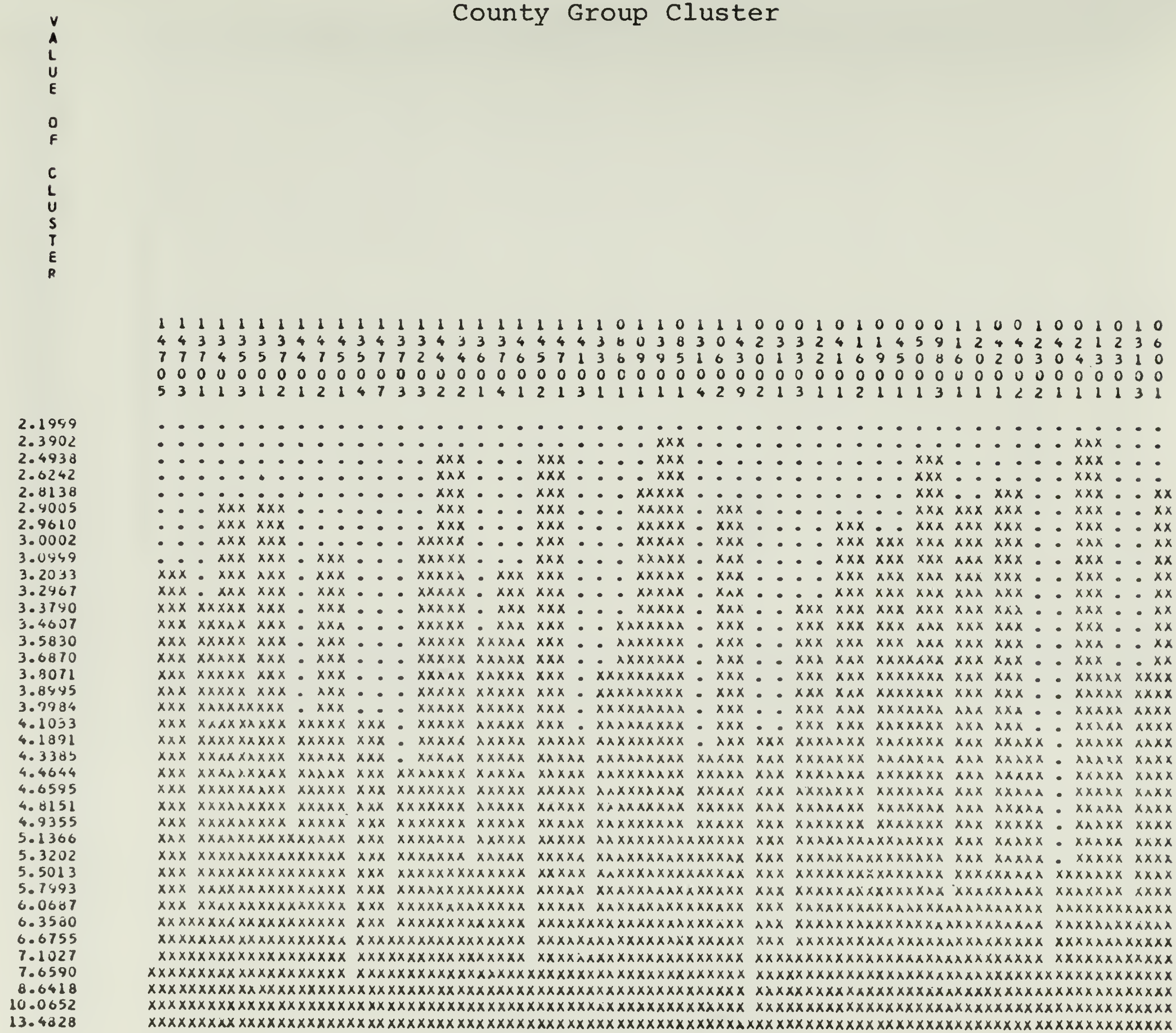

TABLE B-5 (continued)
County Group Cluster

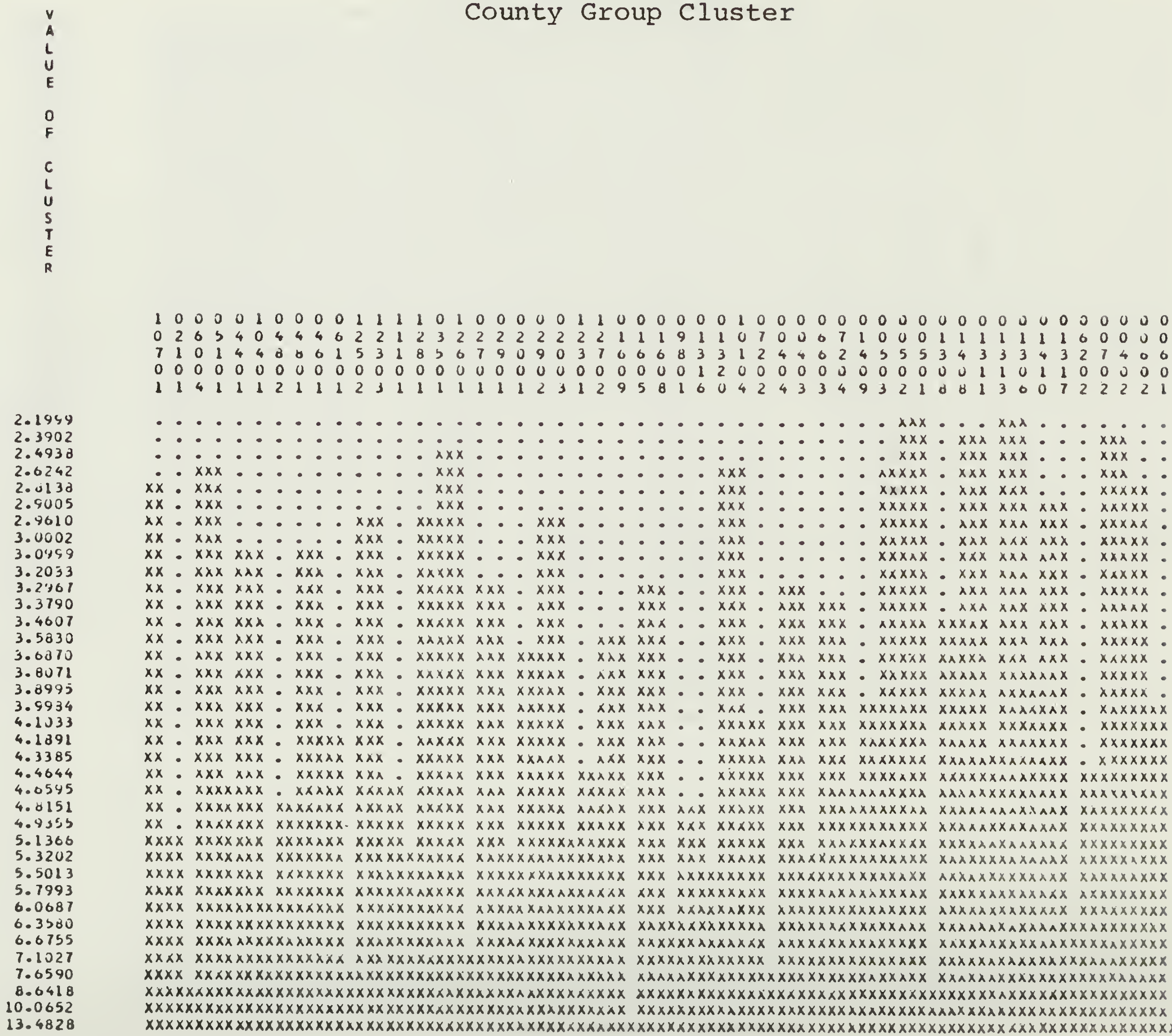

TABLE B-5 (continued)
County Group Cluster

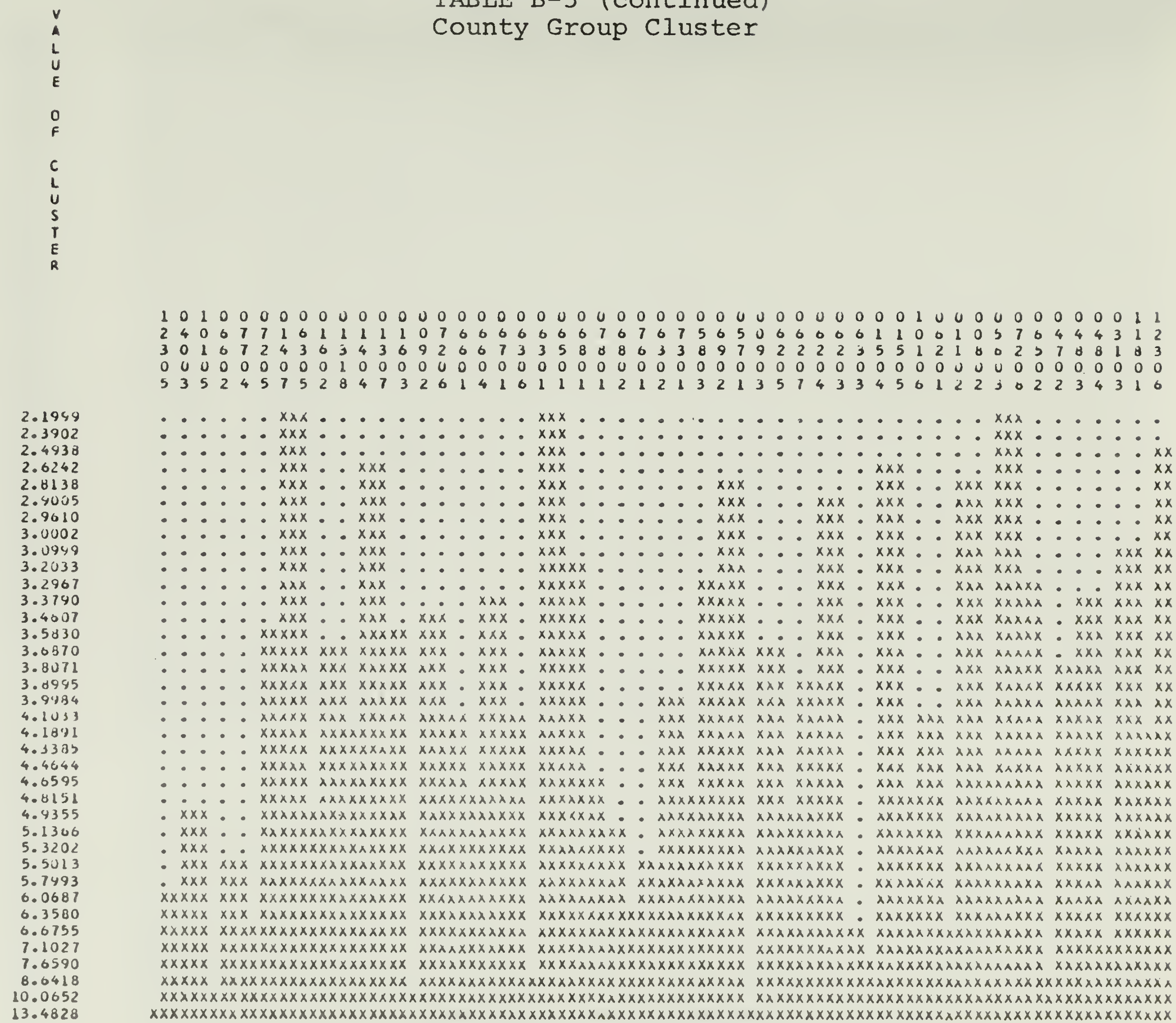

TABLE B-5 (continued)
County Group Cluster

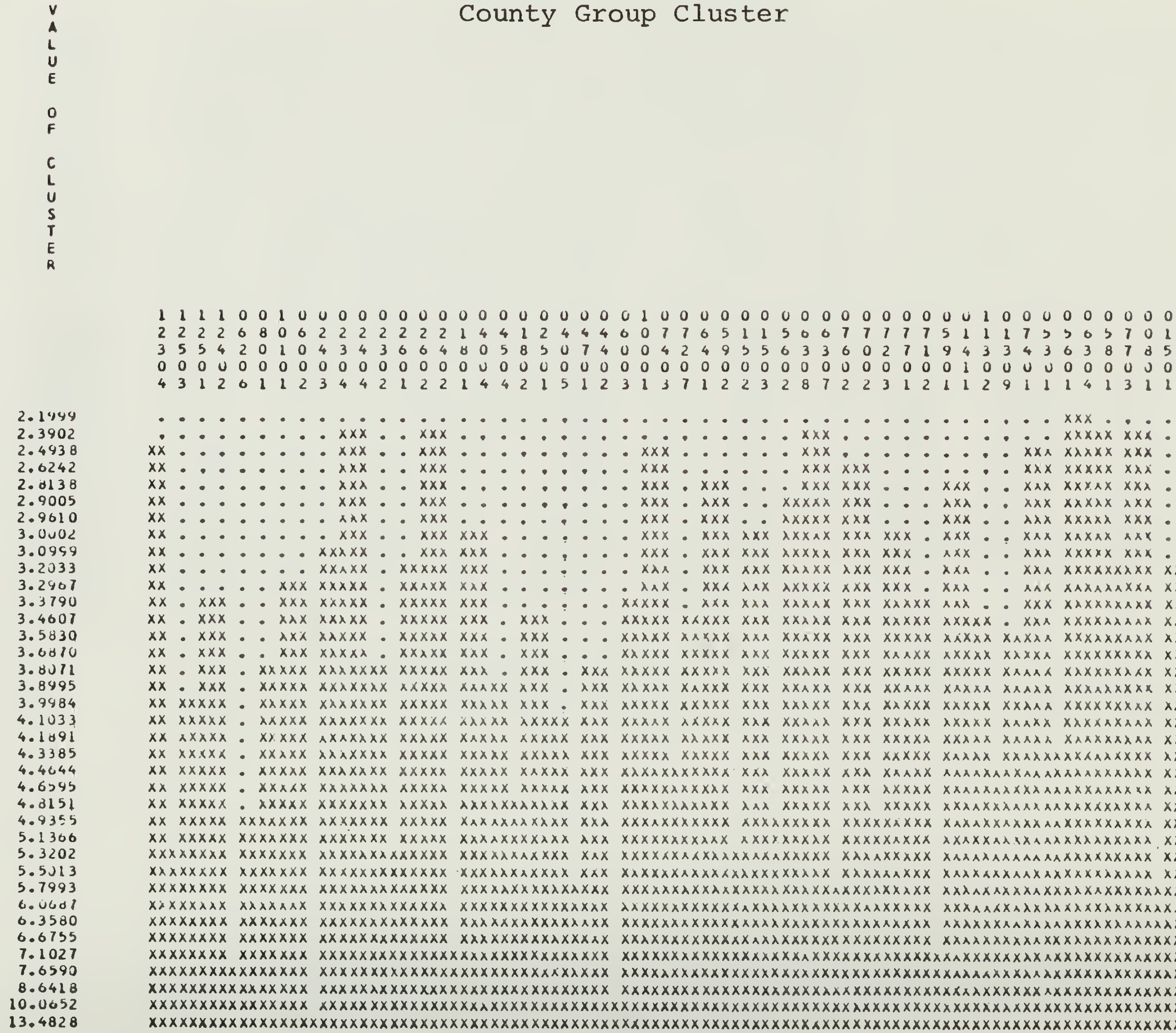

TABLE B-5 (continued)
County Group Cluster

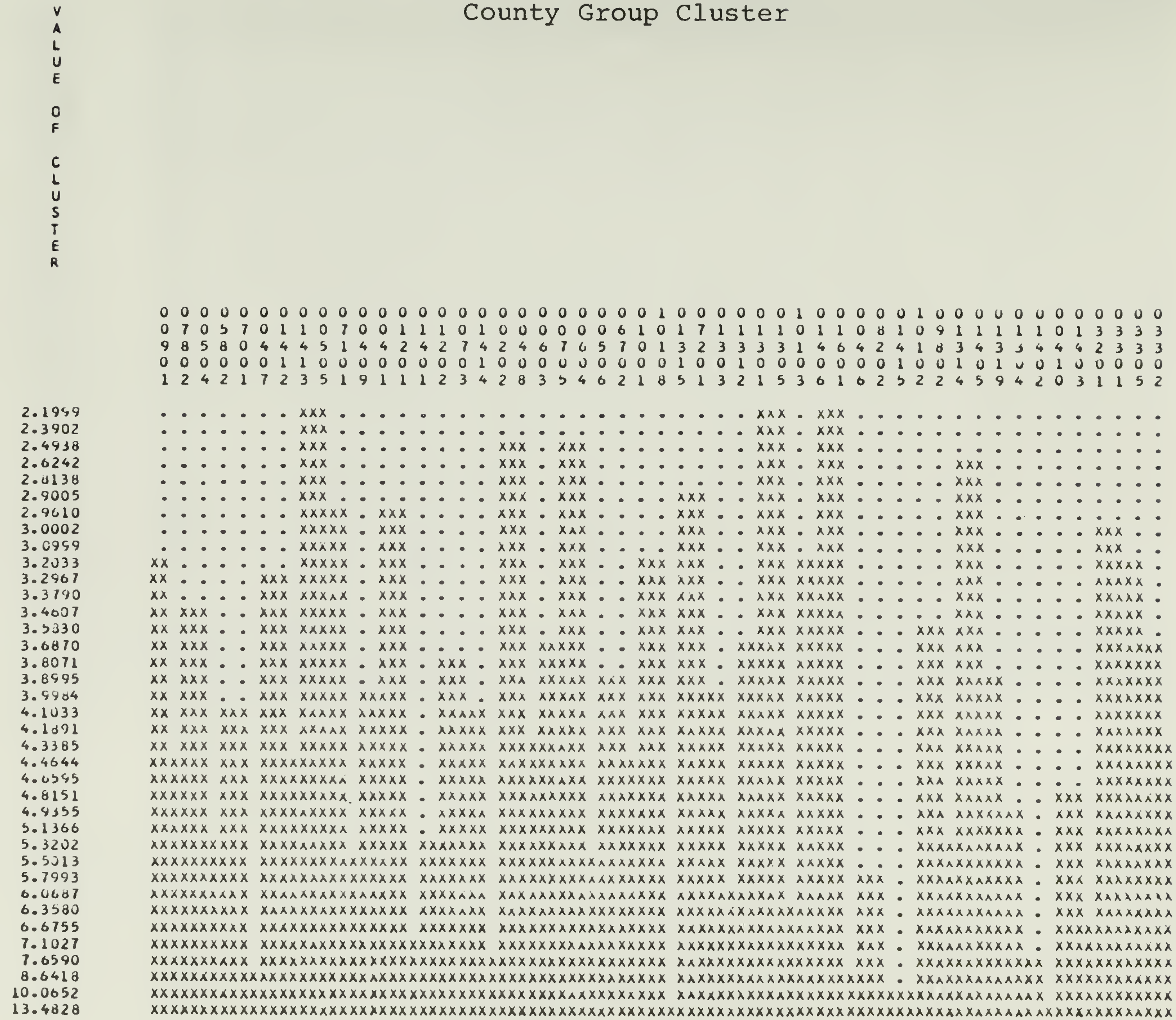

TABLE B-5 (continued)
County Group Cluster

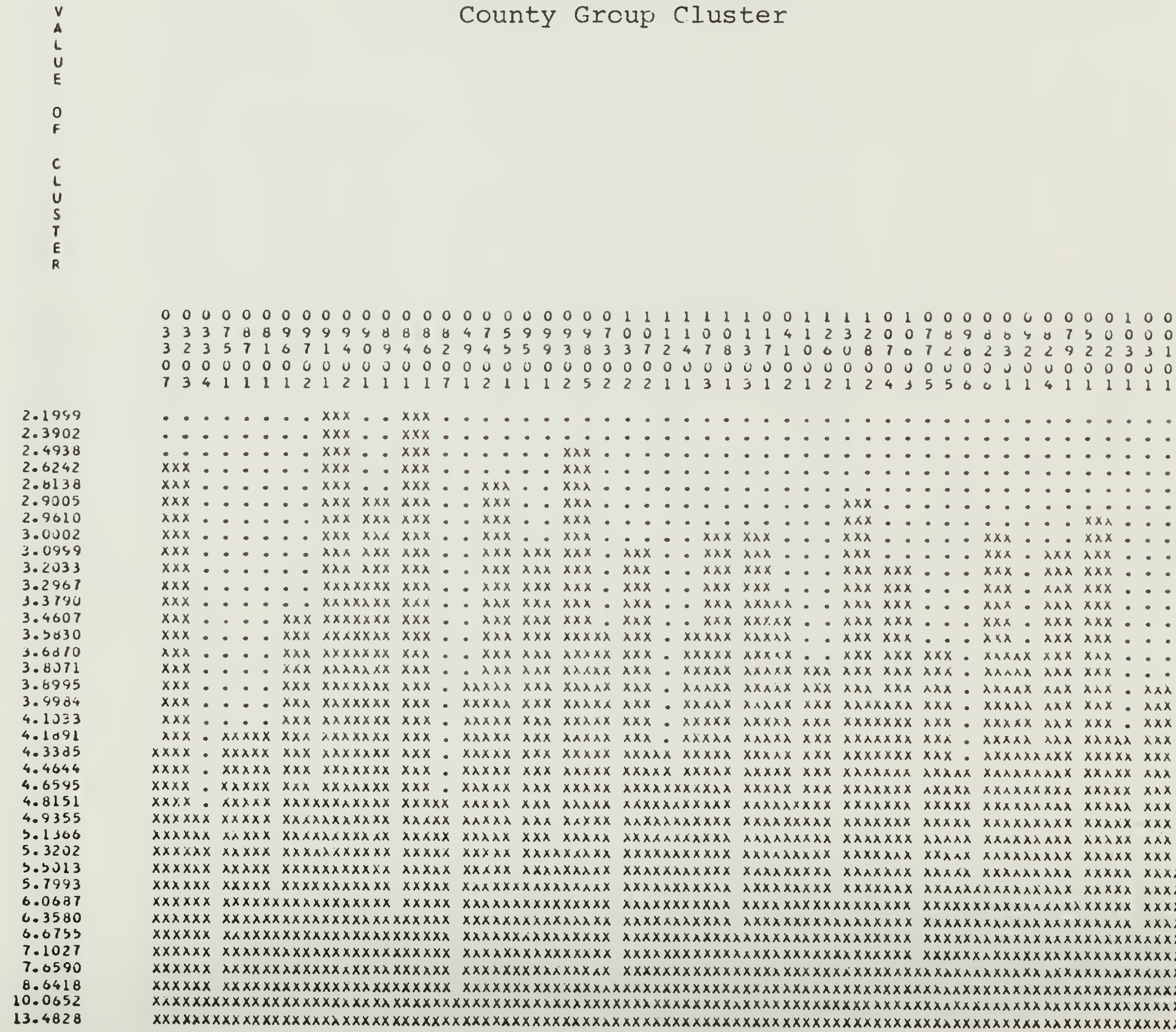

TABLE B-5 (continued)
County Group Cluster

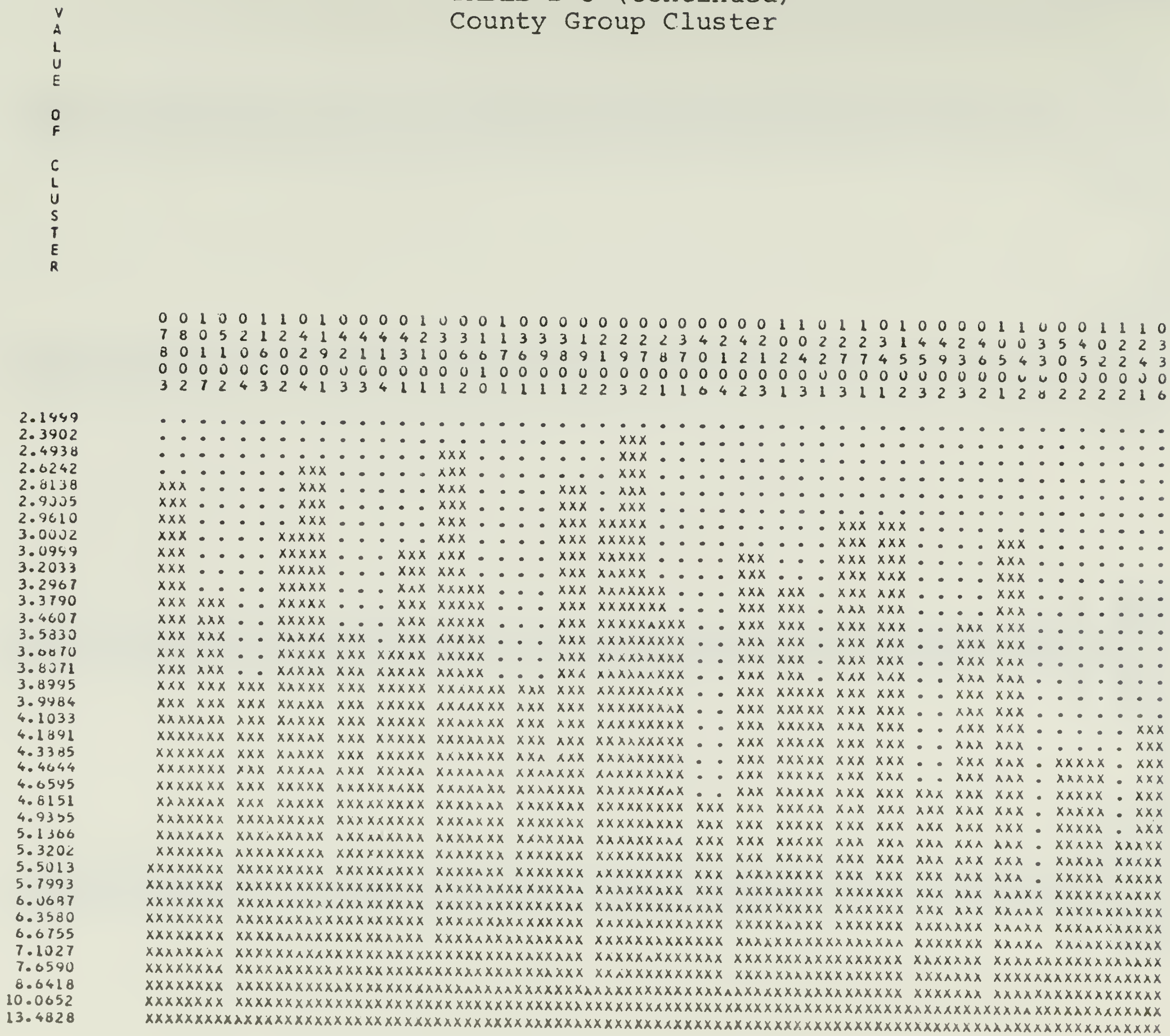

TABLE B-6

COUNTY GROUP TRANSFORMATIONS

AGGREGATION CODE	COUNTY GROUP CODE
01	01301
02	01305
02	01312
03	07201
04	01315
04	01303
05	01406
06	12302
06	10103
06	01601
07	01604
07	14704
07	01302
08	00403
08	00404
08	01409
09	01308
09	01408
09	01311
10	01313
10	01306
11	01320
11	10104
11	01307
12	06603
12	07204
12	07704
12	09801
12	07202
13	01605
13	01608
13	01316
13	01318
13	01310
14	12902
14	14801
14	08501
14	08301
14	13901
14	13301
14	10603
14	14309
14	10602
14	14902
15	14103
15	14307
15	14306
15	14305
15	14304
15	14303
16	14502

TABLE B-6 CONTINUED

COUNTY GROUP TRANSFORMATIONS

AGGREGATION CODE	COUNTY GROUP CODE
16	14701
16	14708
16	14201
16	14101
17	13504
17	14707
17	13601
17	14601
17	13704
17	14401
18	13703
18	13801
18	13402
18	14402
18	13203
19	13101
19	14302
19	13102
19	14706
20	13401
20	13503
20	14501
20	14702
20	13501
21	14301
22	14703
22	14705
22	09701
22	10601
22	13702
22	00405
23	06601
24	00902
24	07206
24	06604
24	06701
24	06306
25	07601
25	06302
25	07301
25	05803
25	06902
25	05701
26	08203
26	13502
26	06602
26	01407
26	06305
26	07205
26	01404
26	01319

TABLE B-6 CONTINUED

COUNTY GROUP TRANSFORMATIONS

AGGREGATION CODE	COUNTY GROUP CODE
27	01606
27	14901
27	12901
27	04302
27	03202
28	02701
28	02901
28	12301
28	12702
28	01609
28	14002
28	14001
29	00701
29	05901
29	06501
29	06301
30	07703
30	00801
31	05001
31	09803
31	11302
32	05801
32	06304
32	05601
33	05301
33	07401
33	01309
33	07001
33	05802
33	10102
33	09802
34	12402
34	12501
34	02001
34	02902
34	02003
34	01603
34	01411
35	02301
35	11301
35	02401
36	03303
36	03302
37	04001
37	12502
37	12303
38	11601
38	12001
38	04101
38	12201
38	04201

TABLE B-6 CONTINUED

COUNTY GROUP TRANSFORMATIONS

AGGREGATION CODE	COUNTY GROUP CODE
38	04002
38	01901
38	04501
39	00901
39	04801
39	06004
39	05101
39	10401
39	04401
39	04802
39	06101
39	04601
40	01314
40	01405
40	01317
40	06202
41	01602
41	01410
41	01401
41	01304
41	01501
41	00601
41	01402
41	03101
41	02002
42	02101
42	11001
42	09804
42	14102
42	10701
42	06001
42	14308
42	03102
43	08201
43	13202
43	09401
43	13701
43	13103
44	06605
44	06903
44	06702
44	13201
44	13104
44	05501
44	07402
44	04901
44	06901
44	07702
44	05401
45	01607
45	11501

TABLE B-6 CONTINUED

COUNTY GROUP TRANSFORMATIONS

AGGREGATION CODE	COUNTY GROUP CODE
45	09301
45	08202
45	00406
46	01610
46	11701
46	03001
46	02004
46	03601
46	11801
46	11602
46	04102
46	03103
47	02102
47	02903
47	02702
47	02801
47	03701
47	03901
47	03801
47	01902
48	11603
48	12306
48	12304
48	11901
48	12002
48	04204
49	03401
49	11502
49	12703
49	12701
49	02201
49	10403
49	10201
49	04202
49	02103
50	05602
50	06307
50	06308
50	06003
50	07403
50	10001
50	07207
50	06401
50	05902
50	06802
50	07801
50	06801
51	07901
51	08204
51	09201
51	09501

TABLE B-6 CONTINUED

COUNTY GROUP TRANSFORMATIONS

AGGREGATION CODE	COUNTY GROUP CODE
51	09901
51	09302
51	09805
51	07302
52	10302
52	10702
52	11401
52	10801
52	10703
52	12602
52	12503
53	10901
53	12802
53	11101
53	13001
53	12801
53	12601
53	03501
54	07501
54	08101
54	08701
54	08301
54	08206
54	08401
54	08601
54	08207
55	09601
55	09702
55	11201
55	08901
55	09001
55	09402
55	09101
55	09806
55	08205
56	03304
56	03308
56	03203
56	03307
56	03305
56	03301
56	03201
57	00202
57	00408
57	01101
57	07002
57	07102
57	07701
57	07203
58	07602
58	07705

TABLE B-6 CONTINUED

COUNTY GROUP TRANSFORMATIONS

AGGREGATION CODE	COUNTY GROUP CODE
58	06502
58	07208
58	05603
58	12305
58	10105
58	04003
59	02302
59	02403
59	02404
59	02304
59	04006
59	02104
60	04005
60	04402
60	02601
60	02602
60	02402
61	03306
61	12401
61	12202
61	05002
61	04502
61	10402
61	10501
61	10301
61	10202
62	02303
62	04602
62	04104
62	04301
62	04203
62	04103
62	12101
62	03602
63	01802
63	02501
63	04701
63	04504
63	04004
63	01801
63	04503
63	04902
64	00703
64	01414
64	06303
64	01502
64	01503
64	01412
65	01504
65	01505
65	06201

TABLE B-6 CONTINUED

COUNTY GROUP TRANSFORMATIONS

AGGREGATION CODE	COUNTY GROUP CODE
65	07803
65	08002
65	10106
65	10107
65	05102
65	04803
65	04804
65	04702
66	06002
66	10101
66	08001
66	06206
66	06203
66	06204
66	06207
66	06205
66	00903
67	01415
67	00401
67	01201
67	01202
67	01403
67	00505
67	01413
67	07101
67	00410
68	00409
68	00503
68	00502
68	00501
69	00402
69	00702
69	00407
69	00602
69	00604
69	00603
70	00506
70	00705
70	10108
70	01001
70	00704
70	01102
70	00802
70	07802
70	00504
71	00201
71	05201
71	11303
71	01701
71	00301
71	00101

B.5 Summary

The one in one hundred public use sample of basic records from the 1970 census served as the primary data source for this study. For each household in the sample, information is provided about the housing unit itself, as well as the characteristics of the household members. Each household member is designated as living in one of 408 county groups areas or subareas. Unfortunately, the sample populations of many of the county groups is very small. Hence, the standard errors of county group proportions are very large. In order to correct for this deficiency in the data base, it was necessary to aggregate the county groups.

As a first step in the aggregation procedure, the major uncorrelated dimensions of the economic structure of the county groups were identified. The data base was comprised of nine labor market variable sets computed from the basic records. The chief empirical tool used in this investigation was the principal component model with special reference to factor analysis and factor rotation techniques. The matrix of scaled eigenvalues, referred to as the factor loading matrix, was rotated to orthogonal simple structures using the varimax method to facilitate interpretation. It was found that over 70 percent of the variance in the original data matrix could be embodied in fourteen basic dimensions.

A distance matrix provided the basis for comparing county groups with regard to their factor scores. Comparing county groups on the basis of distance is in effect comparing the county groups on the basis of the original variables except that the artificial weighting of correlated variables is removed. The distance function utilized in this study was a weighted Euclidean formulation of the distance function. The square of the distance vector was weighted by the square root of the corresponding eigenvalue. Thus, those factors which could explain the greatest percent of variance were given the greatest weight in computing distance.

The distance matrix was analyzed using a hierarchical clustering algorithm developed by Johnson with special additions by Gruvaeus and Wainer. The algorithm provided unique clusters and unique clsuter order. The aggregated county groups were formed through a visual inspection of the cluster configuration under the condition that no aggregated county group should have a sample population of less than 20,000 individuals. This condition was imposed to insure that the general goal of reducing the standard errors of the regional proportion was satisfied. Altogether, 71 aggregated county groups were formed from the 408 county group areas or subareas.

APPENDIX C

MINIMUM WAGE PROVISIONS OF THE FAIR LABOR STANDARDS ACT

Earlier studies of the impact of minimum wages on the demand for youth labor or the unemployment of youth using cross-sectional data have included only state minimum wages in their analysis. This implicitly assumes that the impact of the federal minimum wage is constant across geographical areas. However, given the diverse nature of economic activity in various geographical areas of the United States, it is doubtful if this implicit assumption is satisfied. The first part of the present chapter examines in some detail the variation in minimum wage coverage by states.

If there is a large degree of variation in the impact of the minimum wage across geographical areas, the data needed to test the proportionate demand model does not exist in any published form. To my knowledge, no one has ever attempted to estimate wage rates for "covered" and "uncovered" workers by labor classes for regions. This means that we must attempt to estimate these wage rates for ourselves from some raw data base. To do so requires precise definitions of coverage status. The present appendix provides an exhaustive description of "covered" workers and "uncovered" workers and develops a decision rule for placing individuals in one of the two categories in the last half of the appendix.

C.1 The Minimum Wage Provisions of the Fair Labor Standards Act

The Fair Labor Standards Act of 1938 (FLSA), as amended, established minimum wages, maximum hours, overtime pay and child labor standards for covered employment. Of these provisions, only those directly related to the establishment of minimum wages are of immediate interest for the purpose of this study. The historical development of these provisions will receive only a cursory examination. Of primary importance are the provisions of the FLSA as of 1970, when the data used in this study was collected.

The minimum wage provisions of the Act were originally extended to employees individually engaged in interstate commerce, in the production of goods for interstate commerce, or in activities necessary for such operations. Since 1938, a number of amendments have both extended the coverage of the Act and increased the minimum wage. Table C-1 provides a guide to the historical development of the minimum wage.

Effective in 1938, the minimum wage was set at 25 cents an hour with provisions for increases to 30 cents in 1940 and 40 cents in 1945. The FLSA was amended as of January 1950 to raise the statutory minimum to 75 cents and to provide for a number of minor coverage changes. Further amendments in 1956 and 1961 raised the statutory

Table C-1

Minimum Wage Standards Established under the Fair Labor Standards Act, 1938-1974

Act or amendment	Minimum wage Standards	
	Rate	Effective Date
Fair Labor Standards Act of 1938	$0.25	10/24/38
	.30	10/24/39
	.40	10/24/45
Fair Labor Standards Amendment of 1949	.75	1/25/50
Fair Labor Standards Amendments of 1955	1.00	3/1/56
Fair Labor Standards Amendments of 1961		
Employees covered prior to the 1961 Amendments	1.15	9/3/61
	1.25	9/3/63
Employees covered as a result of the 1966 Amendments	1.00	9/3/61
	1.15	9/3/64
	1.25	9/3/65
Fair Labor Standards Amendments of 1966		
Employees covered prior to the 1966 Amendments	1.40	2/1/67
	1.60	2/1/68
Nonfarm employees covered as a result of the 1966 Amendments	1.00	2/1/67
	1.15	2/1/68
	1.30	2/1/69
	1.45	2/1/70
	1.60	2/1/71

Table C-1
(Cont.)

Act or amendment	Minimum wage Standards Rate	Effective Date
Hired farmworkers	1.00	2/1/67
	1.15	2/1/68
	1.30	2/1/69
Fair Labor Standards Amendments of 1974		
Employees covered prior to the 1966 Amendments	2.00	5/1/74
	2.10	1/1/75
	2.30	1.1/76
Nonfarm employees covered as a result of the 1966 or 1974 Amendments	1.90	5/1/74
	2.00	1/1/75
	2.20	1/1/76
	2.30	1/1/77
Hired farmworkers	1.60	5/1/74
	1.80	1/1/75
	2.00	1/1/76
	2.20	1/1/77
	2.30	1/1/78

SOURCE: U. S. Department of Labor, Employment Standards Administration, table titled, "Minimum Wage and Overtime Standards Established Under the Fair Labor Standards Act, 1938-1974," Washington, April 1974. (Mimeographed.)

minimum to $1.00 in March 1956, $1.15 in September 1961 and $1.25 in September 1963. The amendments effective in 1961 also provided for the extension of coverage to many additional workers.

The Fair Labor Standards Act was again amended in 1966. The amendments effectively established three separate statutory minimum wages until February 1, 1971. Workers covered by the Act prior to February 1, 1967, workers newly covered by the 1966 amendments and workers on certain farms were protected by different levels of the minimum wage until February 1, 1971. The various levels of the minimum wage and the dates they became effective, are given in Table C-1. The 1966 amendments resulted in a rate of increase of 28 percent in the wage paid to employees covered prior to the 1966 amendments between January 31, 1967 and February 1, 1968. The wage for employees newly covered by the 1966 amendments increased 60 percent between February 1, 1967 and February 1, 1971. The wage rate for employees on covered farms increased a more modest 30 percent between February 1, 1967 and February 1, 1969.

The definitions of previously covered employment, newly covered employment and covered farm employment are extremely involved and complicated. For this reason, they will be sketched in outline form, rather than be presented in their entirety. The definitions will, however, be sufficient for our purposes.[1]

The FLSA, as amended in 1966, defines previously covered employees as:

A. Employees individually engaged in interstate of foreign commerce. Such employees include:

1. Workers in telephone, telegraph, radio, television and transportation industries and workers who build and maintain highways, railroads and airfields.

2. Workers in distribution industries who order, receive, handle, or keep records of goods moving in interstate commerce and workers who regularly use the telephone, telegraph, or mail for interstate communications.

3. Workers who service vehicles or equipment used in interstate commerce or who regularly travel across state lines while working.

B. Employees engaged in the production of goods for interstate or foreign commerce. Such employees include:

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[1]The definitions were compiled from a number of different sources. See, U.S. Department of Labor, Employment Standards Administration, Handy Reference Guide to the Fair Labor Standards Act (Washington: U.S. Government Printing Office, 1972); U.S., Congress, House, Committee on Education and Labor, Federal Labor Laws, 90th Cong., 1st sess., 1967 (Washington: U.S. Government Printing Office, 1967), pp. 42-53; and U.S., Congress, Senate, Committee on Labor and Public Welfare, Legislative History of the Fair Labor Standards Amendments of 1966, 90th Cong., 2nd sess., 1968 (Washington: U.S. Government Printing Office, 1968), pp. 1-16.

1. Workers in manufacturing establishments, distribution establishments, mines, quarries and oilfields that produce goods for interstate or foreign commerce. This includes workers employed by the primary producer as well as an intermediary. Thus, workers in establishments that provide intermediate goods or services to a producer of goods shipped in interstate commerce are covered.

C. All employees in certain large enterprises if there are any workers in the enterprise engaged in the production, handling or selling of goods involved in interstate or foreign commerce. The inclusion of such enterprises is based on their character of business and their annual gross sales. Such enterprises are covered provided that:

1. It is engaged in construction and has an annual gross sales of $350,000 or more.

2. It is engaged in the gasoline service trade and has an annual gross sales of $250,000 or more.

3. It is engaged in urban or interurban transit service and has an annual gross sales or one million dollars or more.

4. It has at least one retail or service establishment and an annual gross sales of one million or more, and purchases at least $250,000 worth of goods annually that have moved across state lines for resale.

5. It is an establishment of an enterprise which has annual gross sales of one million dollars or more, and the enterprise has some employees in the handling, selling, or production of goods involved in interstate commerce.

The FLSA, as amended, defines newly covered employees as:

D. <u>Employees in enterprises that satisfy condition C, but not conditions 1-5 under condition C, but where</u>:

1. The enterprise has an annual gross sales of at least $250,000.

2. The enterprise is engaged in the business of construction.

3. The enterprise is engaged in laundering, cleaning, or repairing clothing.

4. The enterprise is engaged in the operation of a hospital, nursing home, or school.

Also defined as newly covered employees are employees of taxicab companies, additional transit companies and certain hotels, motels, restaurants and retail and service establishments. The amendments of 1966 also provided an extension of coverage to certain farm workers employed by an enterprise which used more than 500 man-days of farm labor in any quarter of the preceding year.

The FLSA, as amended, also provides for specific exemptions from the minimum wage provision. Employees exempted from the Act include:

1. Employees in establishments which have as their only employees the owner, his spouse, his children, or his parents.

2. Employees of federal hospitals or nursing homes.

3. Executive, administrative and professional employees including teachers and administrators in schools and outside salesmen.

4. Employees of certain seasonal amusement establishments, motion picture theaters, small newspapers, small telephone companies (switchboard operators only) and fishermen.

5. Employees in establishments not satisfying conditions A-D.

C.2 The Extent of Coverage of the Minimum Wage Provisions of the Fair Labor Standards Act by States

It should be obvious from a casual reading of the definitions of newly covered employees and previously covered employees that the minimum wage provisions of the Fair Labor Standards Act affect a large percentage of the civilian labor force. In September 1971, about 60 percent of all wage and salary workers in the civilian labor force were covered by the minimum wage provisions of the FLSA. About 75 percent of these workers were employed in jobs previously covered by the Act and about 25 percent were employed in jobs covered as a result of the 1966 amendment to the Act.[2]

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[2]U.S. Department of Labor, Employment Standards Administration, Minimum Wage and Maximum Hours Standards Under the Fair Labor Standards Act, Economic Effects Study, submitted to Congress, 1972 (Washington: U.S. Government Printing Office, 1972), pp. 37-38, Table 7. Given the time frame of the study, data relating to 1970 would have been more appropriate. Unfortunately, figures reported in years prior to 1971 include only the private sector.

Since different geographic regions have a tendency to have different economic bases, it would not be surprising to find that they differ as to the percentage of their employment covered by the FLSA. Table C-2 provides a breakdown of employment covered by the minimum wage provisions of the FLSA by states. States such as Ohio, Pennsylvania and New Jersey, that have a high percentage of their employment in large industrial firms, tend to be the states most extensively covered by the minimum wage provisions of the Act. Other areas, such as North Dakota, South Dakota and the District of Columbia, that have a high percentage of their employment in agriculture, small firms, or federal agencies, tend to have a much lower percentage of their employment covered.

There is definite variation in the percentage of employment covered in the various states. There is over a 26 percentage point difference between the District of Columbia and Connecticut. However, most of the states cluster in the 55 to 65 percentage point range. The mean percentage of employment covered is 59.62 percent with a standard deviation 5.39 percentage points for the fifty states and the District of Columbia. This gives a coefficient of variation of 9.04.

The 1966 amendments to the FLSA did not affect all states to the same degree. States such as Pennsylvania,

Table C-2

Percentage of Wage and Salary Workers in Civilian Labor Force--September 1971

State	Fed. Covered	Fed. Old Covered	Fed. New Covered	State Only Covered
Alabama	60.80	46.43	14.37	0.0
Florida	61.32	40.23	21.09	0.0
Georgia	62.56	48.43	14.13	11.68
Kentucky	61.48	44.98	16.50	14.04
Mississippi	57.76	42.39	15.37	0.0
North Carolina	66.03	52.97	13.06	8.38
South Carolina	64.10	50.74	13.36	0.0
Tennessee	63.95	49.79	14.16	0.0
Connecticut	66.89	53.04	13.85	14.95
Maine	62.13	44.97	17.16	10.62
Massachusetts	63.36	47.78	15.67	14.01
New Hampshire	61.62	46.13	15.50	10.33
Rhode Island	64.76	49.86	14.90	13.18
Vermont	58.60	40.76	17.83	9.55
Illinois	65.18	51.41	13.77	9.05
Indiana	66.65	52.64	14.01	8.36
Michigan	65.95	51.28	14.67	11.53
Minnesota	62.00	45.88	16.12	14.08
Ohio	65.77	52.18	13.59	2.97
Wisconsin	62.14	46.70	15.44	7.72
Arkansas	55.94	40.10	15.85	4.28
Louisiana	59.83	44.04	15.79	0.0
New Mexico	53.14	33.99	19.14	8.58
Oklahoma	58.48	39.78	18.70	10.85
Texas	60.82	44.27	16.82	14.43
Colorado	58.82	40.05	18.77	3.27
Montana	50.00	31.25	18.75	22.32
North Dakota	48.42	27.89	20.53	10.00
South Dakota	46.56	27.51	19.05	24.87
Utah	57.07	38.30	18.77	3.34
Wyoming	51.61	34.68	16.94	12.90
Iowa	57.96	40.95	17.01	0.0
Kansas	56.84	39.46	17.38	0.0
Missouri	62.76	47.59	15.17	0.0
Nebraska	56.87	38.93	17.94	8.59
New Jersey	63.94	51.68	12.26	14.30

Table C-2
(Cont.)

State	Fed. Covered	Fed. Old Covered	Fed. New Covered	State Only Covered
New York	61.93	47.79	14.14	8.79
Delaware	64.38	50.23	14.16	13.24
District of Columbia	40.68	24.92	15.76	8.14
Maryland	57.77	42.02	15.75	11.88
Pennsylvania	65.82	52.07	13.75	6.70
Virginia	60.93	43.42	17.52	0.0
West Virginia	63.86	49.44	14.42	8.24
Arizona	59.60	41.08	18.52	0.0
California	61.12	43.62	17.50	5.58
Hawaii	61.27	33.65	27.62	11.11
Nevada	55.50	34.86	20.64	15.14
Alaska	55.67	37.11	18.56	9.28
Idaho	54.47	36.60	17.87	11.91
Oregon	58.50	42.89	15.61	12.31
Washington	58.83	41.08	17.75	9.64

SOURCE: U.S. Department of Labor, Employment Standards Administration, Minimum Wage and Maximum Hours Standards Under the Fair Labor Standards Act. Economic Effects Study, submitted to Congress, 1972 (Washington: U.S. Government Printing Office, 1972), pp. 39-42, Table 8.

New Jersey and Ohio, that have a relatively high percent of their employment in large manufacturing firms, have a relatively low percentage of their employment newly covered by the 1966 amendments. On the other hand, states such as Florida, Hawaii and North Dakota, that have a relatively high percentage of their employment in agriculture or nonmanufacturing industries, have a relatively high percentage of their employment newly covered.

There is a larger degree of variation in the percentage of employment newly covered in the various states than in the percentage of total covered employment. There is over a 15 percentage point difference between Hawaii and New Jersey. However, most of the states cluster in the 14 to 17 percentage point range. The mean percentage of employment newly covered by the 1966 amendments is 16.54 percent with a standard deviation of 2.66 percentage points. This gives a coefficient of variation of 16.08 which is considerably larger than the coefficient of variation for total covered employment.

Supervisory employees and outside salesmen are excluded from the minimum wage provisions of the FLSA no matter what the character is of the product they help produce or sell. A second way of looking at the extent of coverage is to net these workers out and concentrate attention on nonsupervisory employees. In September 1971, about 75.52 percent of all nonsupervisory employees, excluding outside salesmen, were covered by the minimum wage provisions of the FLSA. About 75 percent of these workers were employed in jobs previously covered by the Act and about 25 percent were employed in jobs covered as a result of the 1966 amendments to the Act.[3]

Table C-3 provides a breakdown of covered employment of nonsupervisory employees by states. It should be immediately evident that, while the percentages are much larger in Table C-2 than in Table C-3, the relationship between states has changed little. States such as Connecticut, Indiana, Michigan, Ohio and Pennsylvania, that have a relatively high percentage of their employment in manufacturing industries, tend to remain the states most extensively affected by the minimum wage provisions of the FLSA. Other areas such as Montana, North Dakota, South Dakota and the District of Columbia, tend to have a much lower percentage of their nonsupervisory employment covered.

The variation in the states' employment that is covered is evident even after netting out supervisory employees and outside salesmen. There is a 24.86 percentage point difference between the District of Columbia and

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[3]U.S. Department of Labor, Employment Standards Administration, <u>Minimum Wage and Maximum Hours Standards Under the Fair Labor Standards Act</u>, pp. 37-38, Table 7.

Table C-3

Percentage of Nonsupervisory Employees in Civilian Labor Force--September 1971

State	Fed. Covered	Fed. Old Covered	Fed. New Covered	State Only Covered
Alabama	73.96	56.48	14.48	0.0
Florida	74.73	49.03	25.70	0.0
Georgia	75.80	58.68	17.12	14.16
Kentucky	74.26	54.33	19.93	16.96
Mississippi	69.79	51.22	18.57	0.0
North Carolina	78.56	63.02	15.54	9.97
South Carolina	76.80	60.97	16.01	0.0
Tennessee	76.87	59.85	17.02	0.0
Connecticut	80.16	63.56	16.60	17.91
Maine	75.54	54.68	20.86	12.95
Massachusetts	77.04	57.99	19.05	17.04
New Hampshire	74.55	55.80	18.75	12.50
Rhode Island	78.47	60.42	18.06	15.97
Vermont	71.32	49.61	21.71	11.63
Illinois	78.70	62.07	16.63	10.93
Indiana	79.78	63.01	16.77	10.01
Michigan	79.64	61.92	17.71	13.92
Minnesota	75.35	55.76	19.59	17.11
Ohio	79.11	62.76	16.35	3.57
Wisconsin	75.32	56.60	18.72	9.36
Arkansas	66.73	47.83	18.90	5.10
Louisiana	73.30	53.96	19.34	0.0
New Mexico	67.08	42.92	24.17	10.83
Oklahoma	72.49	49.30	23.18	13.45
Texas	74.16	53.98	20.18	17.59
Colorado	72.74	49.53	23.21	4.05
Montana	61.54	38.46	23.08	27.47
North Dakota	60.53	34.87	25.66	12.50
South Dakota	59.06	34.90	24.16	31.54
Utah	71.38	47.91	23.47	4.18
Wyoming	64.00	43.00	21.00	16.00
Iowa	70.77	50.00	20.77	0.0
Kansas	70.12	48.68	21.44	0.0
Missouri	76.17	57.76	18.41	0.0
Nebraska	69.95	47.89	22.07	10.56
New Jersey	76.94	62.19	14.75	17.20

Table C-3
(Cont.)

State	Fed. Covered	Fed. Old Covered	Fed. New Covered	State Only Covered
New York	76.05	58.69	17.36	10.79
Delaware	77.47	60.44	17.03	15.93
District of Columbia	55.30	33.87	21.43	11.06
Maryland	71.35	51.90	19.45	14.68
Pennsylvania	79.20	62.65	16.55	8.07
Virginia	77.42	55.16	22.26	0.0
West Virginia	76.80	59.46	17.34	9.91
Arizona	72.69	50.10	22.59	0.0
California	75.01	53.54	21.47	6.84
Hawaii	75.98	41.73	34.25	13.78
Nevada	70.76	44.44	26.32	19.30
Alaska	71.05	47.37	23.68	11.84
Idaho	67.02	45.03	21.99	14.66
Oregon	71.25	52.24	19.01	14.99
Washington	72.64	50.72	21.91	11.90

SOURCE: U.S. Department of Labor, Employment Standards Administration, Minimum Wage and Maximum Hours Standards Under the Fair Labor Standards Act, Economic Effects Study, submitted to Congress, 1972 (Washington: U.S. Government Printing Office, 1972), pp. 34-42, Table 8.

Connecticut. However, most of the states cluster in the 70 to 80 percentage point range. The mean percentage of employment covered by the minimum wage provisions of the FLSA is 72.96 percent with a standard deviation of 5.53 percentage points. This gives a coefficient of variation of 7.58. Hence, there is about a sixteen percent difference between the coefficient of variation, when all wage and salary employees are included, and the coefficient of variation, when only nonsupervisory employees are included.

The differential impact of the 1966 amendments on the various states are evident using the figures for nonsupervisory employees only. Florida, Hawaii and North Dakota remain some of the states most noticeably affected by the 1966 amendments, while Pennsylvania, Ohio and New Jersey remain some of the least affected states.

The large degree of variation in the percentage of employment newly covered in the various states remains after netting out supervisory employees and outside salesmen. There is more than a 19 percentage point difference between Hawaii and New Jersey. However, most of the states cluster in the 16 to 22 percentage point range. The mean percentage of employment newly covered by the 1966 amendments is 20.31 percent with a standard deviation of 3.52 percentage points. This gives a coefficient of variation of 17.33. Hence, there is about a three percent difference between the coefficient of variation, when all wage and salary employees are included, and the coefficient, when only nonsupervisory employees are included.

In summary, then, there is a good deal of variation in the percent of employment covered in the various states. This is true whether one is examining total covered employment or newly covered employment. This variation cannot be accounted for by the number of supervisory employees or outside salesmen employed in the various states.

C.3 The Extent of Coverage of the Minimum Wage Provisions of the Fair Labor Standards Act by Industries

Any study which examines employment or the demand for certain factors of production using cross-sectional data must attempt to control for regional differences in the percentage of workers covered by the minimum wage provisions of the FLSA. If this study used data by states, it would be possible to use the figures given in Tables C-2 and C-3 to control for differences in coverage between states. However, since this study uses data by county group areas, the state data is largely irrelevant.[4] This is because one would not normally expect the percentage of employment that is covered in the various counties to be constant across counties within the state. Hence, one

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[4] County group data implies data by groups of counties.

would expect different groups of counties within the state to have different percentages of employment covered.[5]

Since this study uses a data base that gives information by individuals, it is possible to aggregate this information to derive a number of characteristics for the county group as a whole. While a number of personal characteristics are given for each individual, three are especially relevant for the purposes of this study. Information is given for each person on what industry he is in, what occupation he is in and what class of worker he is. The question is, then, can this information be utilized to derive estimates of the percent of employment covered by the minimum wage provisions of the FLSA in the various county group areas?

Intuitively, it seems that an individual may be able to be identified as being in covered employment on the basis of what industry he is in. Table C-4 provides a breakdown of covered employment by industry groups. Mining, contract construction, manufacturing and transportation, communications and utilities tend to be the industries most extensively covered. Domestic service is the only industry totally uncovered by the minimum wage provisions

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[5]An added difficulty is the fact that county groups overlap state boundaries. Some county groups overlap as many as four states.

Table C-4

Percentage of Wage and Salary Workers in Civilian Labor Force--September 1971

Industry	Fed. Covered	Fed. Old Covered	Fed. New Covered	State Only Covered
Private Sector				
Agriculture[a]	37.90	0.0	37.90	8.42
Mining	88.60	88.60	0.0	0.16
Contract Construction	91.47	75.94	15.53	0.20
Manufacturing	86.99	86.64	0.35	0.55
Transportation, Communications, Utilities	87.87	85.58	2.28	0.78
Wholesale Trade	65.00	61.96	3.04	2.27
Retail Trade	54.76	30.80	23.97	21.94
Finance, Insurance, Real Estate	65.03	62.81	2.22	3.73
Services (excluding domestic service)[b]	51.67	19.67	32.00	12.16
Domestic Service	0.0	0.0	0.0	0.0
Public Sector				
Federal Government	24.04	0.0	24.04	0.0
State and Local Government	25.75	0.0	25.75	11.48

[a]Estimates for agriculture relate to May 1971.

[b]Estimates for educational services relate to October 1972.

SOURCE: U.S. Department of Labor, Employment Standards Administration, Minimum Wages and Maximum Hours Standards Under the Fair Labor Standards Act, Economic Effects Study, submitted to Congress, 1972 (Washington: U.S. Government Printing Office, 1972), pp. 37-38, Table 7.

of the FLSA. Other industries, including agriculture, are only partially covered. Only about 25 percent of the employees in the federal government and in state and local government are covered. Hence, there is a great deal of variation in the percentage of employment covered by the minimum wage provisions in various industries. In fact, the twelve categories have a standard deviation of 29.96 percentage points and a coefficient of variation of 52.93.

The 1966 amendments to the FLSA had a differential impact on the various industry categories. The amendments resulted in a large increase in the percentage of employment covered in agriculture, retail trade, services, the federal government and state and local government. Between 24 and 38 percent of the employment in these industries is in jobs newly covered by the 1966 amendments. Other industries such as mining, manufacturing and domestic services were virtually unaffected by the 1966 amendments. There is a large variation in the percentage of employment newly covered by the 1966 amendments in various industries. The twelve categories have a standard deviation of 14.18 percentage points and a coefficient of variation of 101.81. Hence, there is a greater relative variation in newly covered employment than in total covered employment.

It should be obvious from Table C-4 that it is impossible to determine if a worker is covered by the minimum wage provision of the FLSA solely on the basis of his industrial classification. However, it is possible to net out supervisory employees and outside salesmen. Table C-5 provides a breakdown of covered employment by industry groups for nonsupervisory employees, excluding outside salesmen.

After netting out supervisory employees and outside salesmen, the industrial categories have clustered into three distinct groups: those industries that are almost totally covered by the minimum wage provisions of the FLSA, those industries that are only partially covered, and those industries that are totally uncovered. Almost all nonsupervisory employees in mining, contract construction, manufacturing, wholesale trade, transportation, communications and utilities and finance, insurance and real estate are covered by the minimum wage provisions of the FLSA. Domestic service remains the only industry unaffected by the minimum wage provisions of the Act. Other industries, such as services, retail trade and agriculture are only partially covered.

Using Table C-5, we can make certain decisions about the coverage status of a given worker in a given industry that have a fixed probability of being right or wrong. For example, 99.1 percent of all nonsupervisory personnel in mining are covered by the minimum wage provisions of

Table C-5

Percentage of Nonsupervisory Employees in Civilian Labor Force--September 1971

Industry	Fed. Covered	Fed. Old Covered	Fed. New Covered	State Only Covered
Private Sector				
Agriculture[a]	40.05	0.0	40.05	8.90
Mining	99.10	99.10	0.0	0.18
Contract Construction	99.53	82.63	16.90	0.22
Manufacturing	99.35	98.95	0.40	0.62
Transportation, Communications, Utilities	98.17	95.61	2.55	0.87
Wholesale Trade	99.68	95.02	4.66	3.48
Retail Trade	60.86	34.22	26.63	24.38
Finance, Insurance, Real Estate	94.35	91.13	3.22	5.42
Services (excluding domestic service)[b]	70.85	26.97	43.88	16.68
Domestic Serivce	0.0	0.0	0.0	0.0
Public Sector				
Federal Government	27.08	0.0	27.08	0.0
State and Local Government	45.63	0.0	45.63	20.35

[a]Estimates for agriculture relate to May 1971.

[b]Estimates for educational services relate to October 1972.

SOURCE: U.S. Department of Labor, Employment Standards Administration, Minimum Wages and Maximum Hours Standards Under the Fair Labor Standards Act, Economic Effects Study, submitted to Congress, 1972 (Washington: U.S. Government Printing Office, 1972), pp. 37-38, Table 7.

the FLSA. Hence, if we decided that each nonsupervisory worker in mining was in covered employment, we would be right 991 times out of 1000. Likewise, if we decided that all nonsupervisory workers in contract contstruction were in covered employment, we would only place five out of every 1000 workers in the wrong coverage group.

One can be fairly confident that any given worker in mining, contract construction, manufacturing, wholesale trade, finance, insurance and real estate, or transportation, communications and utilities is covered by the minimum wage provisions of the FLSA. Likewise, one can be sure that any given worker in domestic services is uncovered. However, much more information is needed about any given worker in agriculture, retail trade, services, the federal government, or state and local government before one can determine his coverage status.

The differential impact of the 1966 amendments on the various industry categories is evident using the figures for nonsupervisory employees only. It remains obvious that the amendments affect employment in agriculture, retail trade, services, the federal government and state and local government to the greatest degree. Between 26 and 45 percent of all nonsupervisory workers in these industries are in jobs newly covered by the 1966 amendments. Other industries such as mining, manufacturing and domestic services remain virtually unaffected by the 1966 amendments.

It should be obvious from a cursory examination of Table C-5 that any given nonsupervisory employee cannot be identified as being newly covered on the basis of his industrial membership unless he is employed in mining, domestic services, or manufacturing. Much more information is needed about any given worker in any of the other industrial categories before one can determine if he is newly covered.

C.4 A Decision Rule for Determining the Coverage Status of Individuals

In April 1970, a survey of employee earnings and hours of work in the private nonfarm economy was taken by the Employment Standards Administration. The purpose of the survey was to derive estimates of wages and hours of work of nonsupervisory employees in all private nonfarm industries by coverage status under the Fair Labor Standards Act. For the purposes of the study, industries were classified as being covered by the minimum wage provisions of the FLSA prior to the 1966 amendments, industries brought under the minimum wage provisions of the Act by the 1966 amendments, and industries largely not covered by the minimum wage provisions of the Act.[6]

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[6] U.S. Department of Labor, Employment Standards Administration, Wages and Hours of Work of Nonsupervisory Employees in All Private Nonfarm Industries by Coverage Status Under the Fair Labor Standards Act, Economic Effects Study, submitted to Congress, 1972 (Washington: U.S. Government Printing Office, 1972), pp. A1-A3.

Using the classification system developed in the survey, the definitions introduced in Section C.1 and the percentage of employment covered in various industries as reported in Section C.3, it is possible to develop a decision rule for classifying individuals by their coverage status.[7] It is then possible to aggregate over individuals in the various coverage categories by county groups to derive aggregated county group measures.

The three decision variables for determining the coverage status of a given worker is his class (that is, if he is self-employed, a federal government employee, and so forth), his occupation and his industry. Figure C-1 gives a visual representation of the decision process.

The decision process itself works much like a sieve. First, it is possible to sift out certain workers on the basis of their class. Self-employed workers are defined as being excluded from this study; those working without pay are defined as being uncovered workers; and federal employees are defined as having indeterminate coverage status. Further decisions about the remaining workers, state and local employees and employees of private companies, need to be made before their coverage

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[7]Valuable information obtained during several long conversations with Jack Karlin, Director, Division of Research, Office of Program Development, Employment Standards Administration, U.S. Department of Labor, is also embodied in the decision rule.

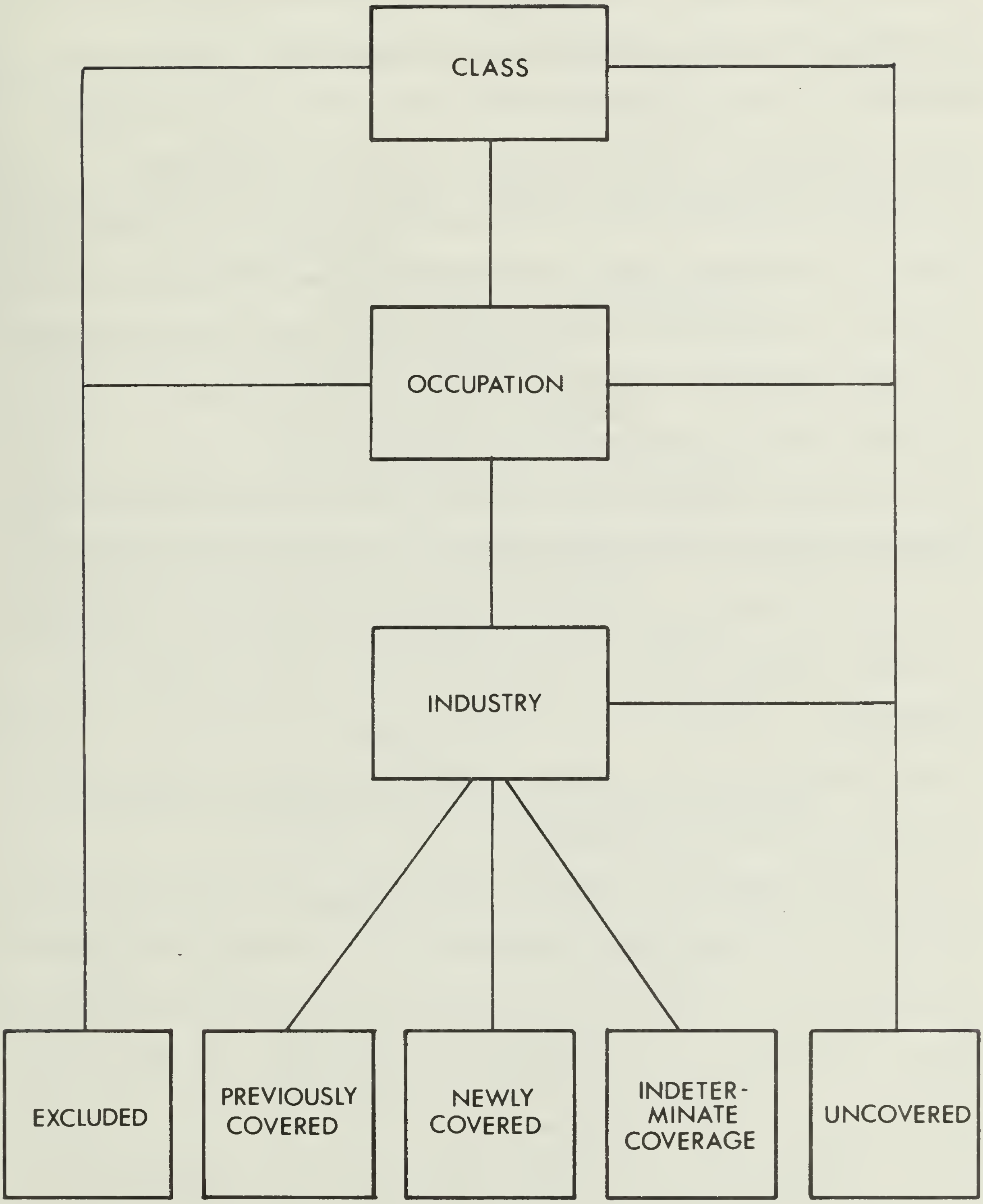

Figure C-1. Diagrammatic Representation of Decision Rule for Determining Coverage Status of Individuals status can be determined.[8] Second, from the remaining group of employees, certain workers may be sifted out on the basis of their occupational membership. Table C-6 provides a list of occupations that can be defined as being excluded from this study. The list includes teachers, certain professional workers, certain managerial workers and other supervisory employees. Table C-7 provides a list of occupations that are defined as being uncovered. The list includes newsboys, farm laborers, unpaid family workers and private household workers.

Third, after sifting out certain employees on the basis of their class membership or occupational membership, it is possible to assign the remaining workers to various coverage status groups on the basis of their industrial membership. Table C-8 provides a list of industries defined to be covered by the minimum wage provisions of the FLSA prior to the 1966 amendments.

The remaining workers who were not sifted out on the basis of their class membership or occupational membership and who are members of these industries, are considered to be previously covered employees. Industries defined to

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[8]All state and local employees are treated differently from employees of private companies. Those who are employed in hospitals or in educational services are defined as newly covered. The remainder are defined as being uncovered.

Table C-6

Occupations Excluded from Study

Census Code	Occupation
001-101, 150-196	Professional, Technical and Kindred Workers, excluding teachers[a]
102-145	Teachers
201-233, 245-246	Managers and Administrators, Except Farm, Excluding School Administrators[b]
235-240	School Administrators
281-282	Sales Representatives
441	Foremen, n. e. c.
801-806	Farmers and Farm Managers
821	Farm Foremen
824	Farm Service Labors, Self-employed

[a] Includes only those who have completed 16 years or more of formal education and who earn $140 or more a week.

[b] Includes only those who earn $125 or more a week.

Table C-7

Occupations Exempted from the Minimum Wage Provisions of the Fair Labor Standards Act

Census Code	Occupation
264	Hucksters and Peddlers
266	Newsboys
823	Farm Laborers, unpaid Family Workers
980-986	Private Household Workers

Table C-8

Industries Covered by the Minimum Wage Provisions of the Fair Labor Standards Act Prior to the 1966 Amendments

SIC	Census Code	Industry
07	018-019	Agricultural Services
10-14	047-058	Mining
15-17	067-078	Construction
19-39	107-399	Manufacturing
40-49	407-499	Transportation, Communications and Utilities
50	507-599	Wholesale Trade
60-64, 67	707-717	Finance and Insurance
73	727-748	Miscellaneous Business Services
762-769	758-759	Miscellaneous Repair Services
807	848	Medical and Dental Laboratories
81	849	Legal Services
84	869	Museums, Art Galleries and Zoos
89	888-897	Miscellaneous Services

Table C-9

Industries Brought Under the Minimum Wage Provisions of the Fair Labor Standards Act by the 1966 Amendments

SIC	Census Code	Industry
65-66	718	Real Estate
721, 727	779	Laundry and Dry Cleaning Establishments
806, 809	838-839	Hospitals and Nursing Homes[a,b]
82	857-867	Educational Services[b]

[a]Excludes federal employees

[b]Includes only federal, state and local employees.

have been brought under the minimum wage provisions of the FLSA by the 1966 amendments are listed in Table C-9. Those workers not sifted out earlier and who are members of these industries are considered to be newly covered employees. Table C-10 lists those industries which are largely uncovered by the minimum wage provisions of the FLSA. Those workers who were not sifted out earlier and who are members of these industries are considered to be newly covered employees. The remaining workers who are members of these occupations are considered to be uncovered employees.

Unfortunately, it is impossible to classify all workers according to their coverage status. The coverage status of enterprises in certain industries is heavily dependent on their annual gross sales. This is especially true of retail trade establishments. Also, the coverage status of farms is totally dependent on the number of farm workers employed on the farm. Since we do not have information about the establishment the worker is employed in, it is impossible to determine the coverage status of workers who are employed in industries where a large number of firms are exempt from coverage because of size conditions. A list of industries considered to have indeterminate coverage is given in Table C-11. Those workers who were not sifted out earlier and who are

Table C-10

Industries Largely Not Covered by the Minimum Wage Provisions of the Fair Labor Standards Act

SIC	Census Code	Industry
08-09	027-028	Forestry and Fisheries
88	769	Private Households
751-753	749-757	Automobile Repair
783, 79	807-817	Theaters and Motion Pictures and amusement and Recreation Services
	868	Not Specified Educational Services
866-869	877-887	Religious, Welfare and Nonprofit Organizations
919-939	907-947	Public Administration
801-804	828-837	Medical Offices
	847	Offices of Health Practitioners
723	787	Beauty Shops
724	788	Barber Shops
725	789	Shoe Repair Shops
722, 726, 729	797-798	Miscellaneous Personal Services

Table C-11

Industries with Indeterminate Coverage

SIC	Census Code	Industry
01	017	Agricultural Production
	029	Agriculture, Forestry and Fisheries, Allocated
521--99	607-699	Retail Trade
	719	Finance, Insurance and Real Estate, Allocated
	767	Business and Repair Services, Allocated
701-704	777-778	Hotels and Motels and Lodging Places
	799	Personal Services, Allocated
	899	Professional and Related Services, Allocated

members of these industries are considered to have indeterminate coverage.

C.5 Summary

It has been shown that there is considerable variation in the percent of employees in the civilian labor force covered by the minimum wage provisions of the FLSA between states. States such as Connecticut, Ohio and Pennsylvania tend to have a large proportion of their employment covered. Other states such as South Dakota, Wyoming and Idaho have a much lower percent of their employment covered. This variation in the percent of employment covered could not be accounted for by differences in the percent of supervisory employees or outside salesmen in the labor force in the various states. It is due entirely to the type of employment offered to non-supervisory employees in the various states. Hence, any study which examines the demand for labor using cross-sectional data must attempt to control for the differential impact of the minimum wage by geographical regions.

To my knowledge, published data on wage rates by coverage status for classes of workers by geographical areas does not exist. In order to "test" the proportionate demand function, we must estimate these wage rates using a raw data base. This requires precise and consistent definitions of "covered" workers and "uncovered" workers. A decision rule was established that could be used in determining the coverage status of any given worker. Individuals were classified as being "excluded from study", "previously covered", "newly covered", "uncovered", or "indeterminate coverage". The decision rule was formulated in such a manner so as to minimize the probability of placing an individual in an incorrect category. For this reason, a number of individuals will fall in the category "indeterminate coverage".

VITA

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